Australian Model Engineering

September-October 1997

Issue 74

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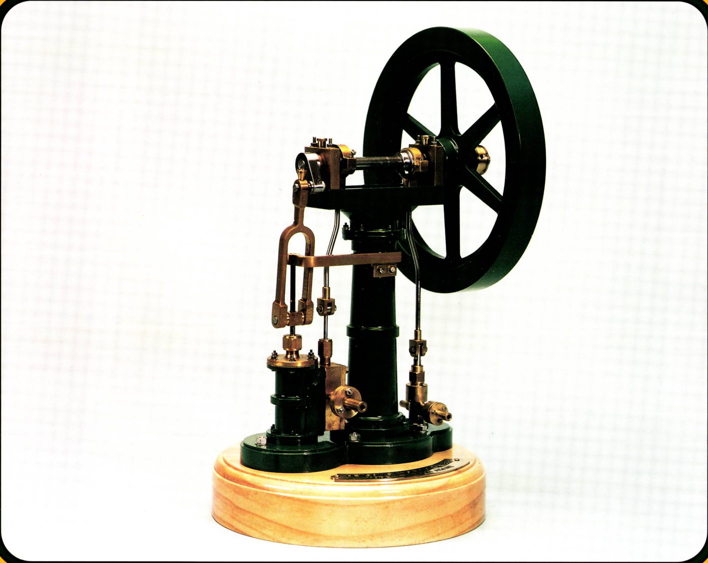

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In This Issue:
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- ☑ A Guide to Metals for the Model Engineer
- ☑ A Different Approach - Welding Copper Boilers

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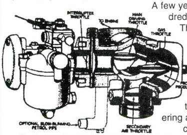


FIG. 19. THE SOLEX GAS-PETROL CARBURETTOR

A few years ago I bought the last few hundred original copies of this 1943 book. They had been found in a warehouse in Australia. After I sold them all, I tried to convince my suppliers to reprint it. They couldn't do it. After several fruitless attempts to find the authors, I just decided to reprint it myself. It's too good not to. Here you get the secrets of powering an automobile on coal, coke, charcoal, and even wood using successful techniques developed in Australia and Europe.

The preface reads: *"The dangers which in 1940 threatened to cut off our petrol supplies, and thereby revived public interest in the gas producer have now passed the threatening stage and are in fact in operation. Lack of shipping space; lack of credits, the necessity of conserving our international balances, the entry of Japan into the war against us all combine to make the conservation of our petrol supplies a stern necessity. Gas producers are now to be seen everywhere supplying in the aggregate millions of miles of travel service which would not otherwise be supplied. It may well be that the gas producer's greatest service to Australia is only just beginning..."*

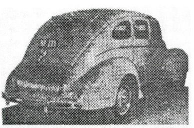
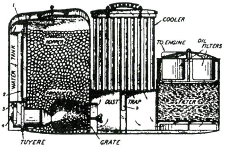


FIG. 14. FORD V8 CAR WITH GAS PRODUCER FITTED IN THE BODY WORK

These days gasoline supplies could be greatly reduced at any moment, not by a war with Japan, but by mid-Easterner's not being able to get along with themselves. We're far more dependent on Arabian oil than most people realize. It could be the early 1970's all over again with gasoline shortages. Build an experimental gas generator and bolt it to an old car. Other people build race cars that move fast. When the oil shortage comes, your charcoal powered auto might be the only auto moving at all! Nuts and bolts how-to. Details you're not going to find anywhere else. A lot of rare information for the money. Get a book and shelve it, even if you don't build a generator. You'll have it when you want it. I won't have to tell you "I don't offer it any more" when you finally do decide to build and want a copy. **Get one NOW!** 5 1/2" x 8 1/2", 194 pages.



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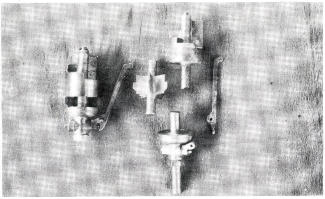

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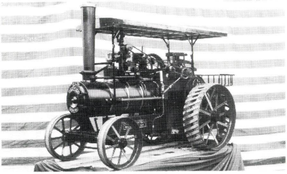

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The Cover

A fully fabricated Benson engine constructed by Leigh Adams in about two weeks! The model won first prize in the inaugural competition held to celebrate the first anniversary of the Waringah Model Engineers. See the other entrants on page 46.

Photo by: William Pooley, Photographer

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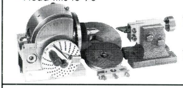

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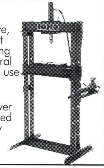

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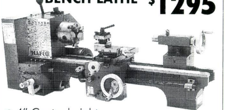

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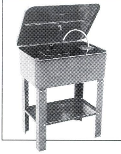

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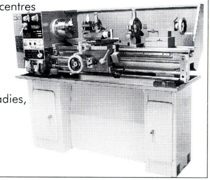

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Comment

The Annual Convention

The annual convention as we now know it, is recognized as the event of the year for most model engineers, especially those of railway persuasion. But it wasn't always so.

The first get-together was in 1956, when the members of the then Surrey Hills club in Melbourne (now the Steam Locomotive Society of Vic.) visited the Sydney Live Steam Locomotive Society at West Ryde (Sydney). In those days there were less than a dozen live steam/model engineering clubs in Australia (including one in Queensland). Not too many of these clubs' members knew of these other clubs, let alone the members! Interstate travel was still uncommon, roads weren't so good and the distances seemed longer. Anyway, it was a success and the people from both states got to know each other, friendships were made. It was all very informal then.

These informal meets quickly became an annual event and South Australia was included in the pilgrimage. Time marched on and in 1966 the annual meet aspired to the name of Convention. More people got to hear of the good times to be had at the annual convention and joined in. It was definitely an event now and had grown to become a big occasion. Lots of organizing and lots of work and money involved for the host club.

Its got to the stage now where the host club is expected to have all the popular gauges available for visitors, on site camping, hot showers, cater for meals twice per day and halls or similar venues for the necessary meetings. Latterly, the host clubs have been providing for miniature road vehicles and marine models. Perhaps this will now be expected from all future host clubs.

The convention's role and needs have certainly changed.

But now I am beginning to wonder. Have we lost sight of what it is all about? Should conventions be held every second year or so instead of annually? Do we really need conventions as we now know them any more? We could now find clubs being formed or adding extra expensive facilities just to enable that club to host one of the conventions. Isn't the club meant to be for the members interests?

Distance is now not the tyranny it used to be. We now see members from other clubs so much these days — via invitation runs, anniversary/birthday runs, 7¼"gauge corroborees, the model engineering exhibition etc., and we also have our magazine to keep us in touch.

Perhaps the big Easter convention as we know it today just isn't as necessary any more as it used to be. It's certainly something to think about!

John Elsol

To our new reader

If this is your first issue of Australian Model Engineering, welcome! We hope you'll look forward to the ideas, news and camaraderie in each bi-monthly issue.

One of the great things about our hobby is the way model engineers actively help each other. Unless you live in an isolated community, you'll soon discover who has valuable experience in your field of interest, or who will help you to make a part that's too big for your workshop machinery. Look in the *Club Roundup* section to find a club that's near to you; pay a visit and you'll usually find model engineers who live not too far away. Then you can experience the great fellowship that makes our hobby special.

This magazine is prepared in the same spirit of "model engineers helping each other". About two dozen people put many hundreds of hours work into each issue — all on a voluntary basis — to help model engineers in Australia and New Zealand keep up to date and stay in touch.

We rely on our readers to write articles for us — for the same (non-existent) rate of pay! If you have ideas or techniques that you feel would be interesting to others, please drop us a line. We'll gladly help with preparation of artwork or editing if that's necessary. Most important of all, please support the people who advertise in our magazine. Without them to pay the bills, you wouldn't be reading this!

Brian Carter

But NOT of us....
GREAT VIDEOS!

Ravenglass & Eskdale Railway - The Cab Ride [55 mins] **£13.85**
Ride the greatest 15" gauge line in the world and have a cab ride from Ravenglass to Dalegarth on "River Mite"! Sparse but effective commentary from driver Ron Clarke. Really great video and highly recommended.

Train Mountain Museum [45 mins] **£17.25**
Interesting video of the first meet at this mind-boggling 7½" set up in Southern Oregon. At the present time it takes about an hour to traverse the nearly 10 miles of track set in 200 acres, but future plans encompass a further 2000 acres and 25 miles of track. Some nice engines as well!

Railroading in a Land of Giants (60 mins) **£19.80**
Railroading in a Land of Giants Vol.2 (65 mins) **£20.65**
These videos were shot on a number of 7½" gauge lines in America, but the joins don't show, as the idea is that the engines and drivers shown are operating real trains. These are superbly crafted videos, especially interesting for the scale rolling stock, and the quantity of it - there is a great scene of a "Big Boy" (British made) pulling out with 43 trucks in the first film, but there is much else to enjoy as well! Highly recommended.

Southern Steam in the 1960s (approx 37 mins) **£14.70**
Adam Harris writes "this is derived from 8mm cine film shot in the early 60s just before the diesels and the coming Bournemouth electrification began to make themselves felt. There are shots at Waterloo, Woking, Guildford, Brookwood and on the Guildford - Horsham and Isle of Wight lines. I am under no illusions about my abilities, but I knew how to use a tripod, and there are some good shots here amongst the *!"%()#! No sound - the film has been transferred as I edited and titled it 25 or more years ago; play a Beatles LP, or an Argo Transacord one if you have to have the "chuff"!" (shows the last days of *real* main-line steam in the U-K)

The Train [128 mins] **£12.15**
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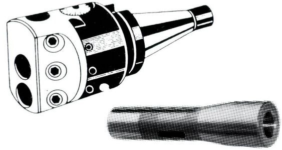

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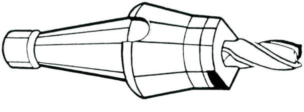

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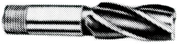

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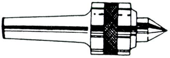

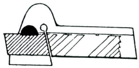

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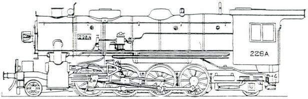

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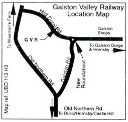

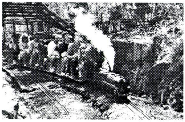

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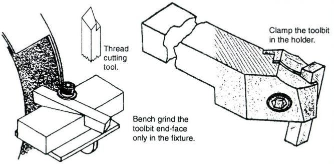
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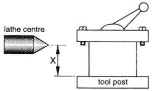

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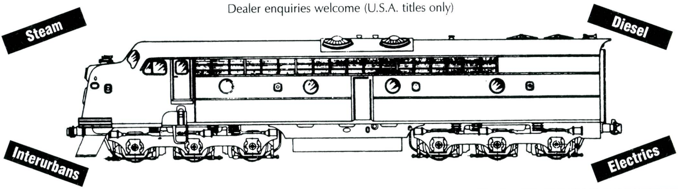

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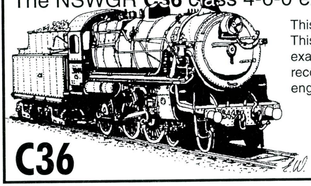

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Welding of Copper Boilers

A Different Approach to Model Boiler Construction

by David C. Evans

Photos supplied by author, drawings for publication by Neil Graham

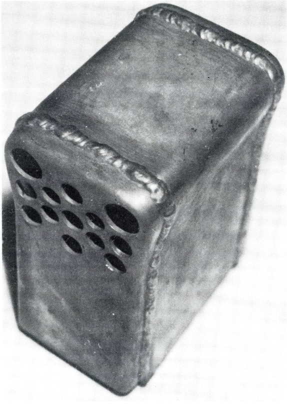


Figure 1. The all welded firebox of a Stirling Single. The use of welding results in bigger water space and improved circulation around the important firebox area.

It is now more that 15 years and a lot of boilers since I first made a serious move to utilize welding as a primary source of joining various sections in model boiler building or if you prefer, construction.

My first attempt at locomotive construction was a Stirling Single 5" gauge and after completing the running gear department, at least to a point where the boiler could be built. By then, I had become a reasonably established member in my own club, Lake Macquarie Live Steam Locomotive Society, and had seen many partly built boilers by various club members and may I say that most were very fine pieces of workmanship.

Emulation and scale

However, I could not accept, what to me, were faults and poor design generally with model boilers and this seemed to be the norm, at least with drawings, from the various model engineering suppliers. That was also the situation with my *Stirling*. I was determined not to build a boiler that had as many pitfalls and problems that I had so far encountered.

Now, I am fully aware that models of any apparatus, must be the likeness of what one is attempting to emulate. Whatever the scale one chooses to use, with boilers in particular, apart from the external measurements, scale and reality begin to go their separate ways. Later on we shall discus this in greater detail.

The welding alternative

This paper is about the use of welding and the many benefits that can be obtained as against construction solely along the original method of our past. Now there is little wrong with our past as it has served me very well. But we can (with little inconvenience), make adjustments that have the most far reaching benefits. So how do we do just that?

Over the years I have bought a number of books by well known model engineering writers and with respect to them, very little has been said about the use and technique of welding copper boilers. The *Model Engineer* (UK) has written a little about the matter, but in general it has been quite sparse.

My background

I would like to put one or two matters into proper perspective. I am not a boilermaker or a railwayman by trade. I spent more than 45 years as a Motor and General mechanic and I have been welding since I was 13. So it was to welding that I turned to put my five-plus decades of ideas into practice.

A Stirling idea

Referring back to my Stirling Single, I decided to use welding on the firebox as a start, to prove if my thoughts held any substance. I went about doing this task in the following manner.

Ideas into practice

I made the front tube plate and backhead plate in the usual way and to the AMBSC Code requirements. I then made the wrapper to be Butt welded to both end plates. I was very pleased with the final result. It had shrunken by the thickness of the wrapper plate ($\frac{1}{8}$") down each side and across the top. This meant a wider foundation ring and longer stays.

It also increased the water capacity and size of space down each side. Refer to the photo of the Stirling firebox in Figure 1. I should mention here that I re-arranged the tube layout from the original drawing — more on that aspect later. By now a good deal of interest in what I was doing was being shown in my club. This led to part building and in some cases completely building boilers for various members. So from there, my boiler building progressed to where it is today. I have no idea how many boilers I have built as I have not bothered to count them. If I include the non-registered "toy" boilers as I call them, it must be in the three figure mark somewhere.

The Stirling Single boiler has proven to be an excellent steamer and recovers steam quickly. It will steam well on any fuel; i.e., char, black coal and coke. It is also quite economical on fuel consumption.

TIG welding

The mode of welding used to weld Copper is known as Tungsten Inert Gas (TIG). It is not the only mode that can be used, but it certainly lends itself well for these projects. To readers not familiar with this, a brief explanation may not be amiss.

I have found some literature on this process and it states that it was in use with the Aluminium industry in 1936. So it has been around longer than I thought. It became very popular in recent years, more or less associ-

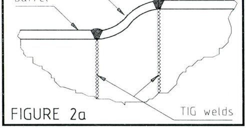


FIGURE 2a

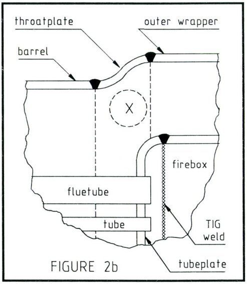
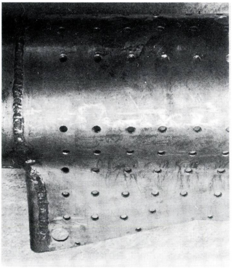


FIGURE 2b



A narrow firebox boiler, in this case a Simplex, showing the welding of the outer wrapper to the barrel and the seam for the throatplate can be just seen in the lower left.

ated with the space age. Lately it has been adopted by the general welding industry for high quality welds of all metals. It is a modern extension of the electric arc and oxy-acetylene processes. It is an electric arc, maintained by passing a current of either polarity (AC or DC) through a Tungsten electrode, which is not consumed during the welding process. The arc is surrounded by a shield of inert gas and the filler metal is added to the molten pool in similar fashion to the oxy-acetylene process. The inert gas around the molten pool keeps the filler and base metals pure, non-oxidized or contaminated. It is normally a flux free weld.

Welding copper

Copper is a very weldable metal, although somewhat difficult with older processes, but with the TIG process it is quite straightforward. I am not going to discuss how to go about the actual welding process as the technique is outside the bounds of this paper.

I think most of us are well aware, that welding is a total fusion process and is not to be confused with the joining processes of silver soldering or bronze brazing/welding. These are joins that are made in which no melting of the parent metal takes place.

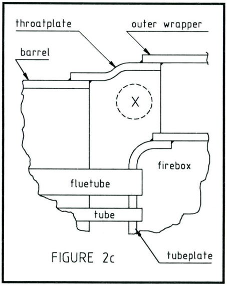


FIGURE 2c

Advantages of TIG

Referring to the Stirling firebox — using the TIG method the construction is simplified and allows the following changes:

- The removal of the barrel butt strap internally and externally.
- Re-arranging the construction of the throatplate to accept the barrel and the firebox outer wrapper. This involved double flanging of the throatplate to full dimensions, so that the barrel, throatplate and wrapper can be butt welded.

Referring to Figure 2a, this clearly shows the two welds and the removal of the lap joint at this part of the boiler.

Looking now at Figure 2b, we have the firebox in position and this shows the complete symmetry of their side face to the boiler case and the firebox outer face.

If you compare Figure 2b and 2c, the difference brought about by the use of welding as compared to the older method of construction is quite appreciable.

The above is a very important part of locomotive-type boiler design and construction. We will look at this first, and tube layout a little further on.

Improving the water flow

Referring to Figure 2d, we are looking at the older method of construction, but with the following modification at point Y. This simple procedure is done to streamline the flow of water in and around the firebox. Once the platework has been formed, strike the approximate position of the working level of the water in the boiler. From this position to the top edge of the foundation ring, file or grind away the inner corners as shown at Y in Figure 2d. However, when doing this, do not leave a sharp edge. Do the same to the corners of the backhead plate and the rear edge of the firebox wrapper. This small modification has no bearing on the strength, or any detrimental effect to the silver soldering process whatsoever, but it has great effect on the movement of water around the water leg of the boiler.

No doubt there are some who may think is a joke, but I can assure you that in small boilers, especially those in 3½" gauge locomotives, the significant improvement in the steaming quality is very noticeable.

If you refer to Figure 2c area marked X, and then Figure 2d at X, there is an enlarge-

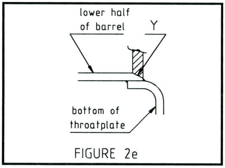
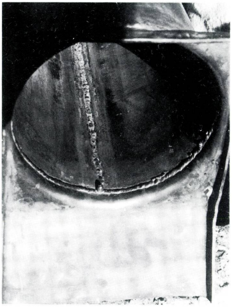
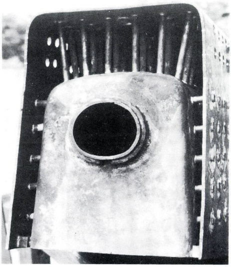


FIGURE 2e



The throatplate for a wide firebox Belpaire boiler, in this case a NSWGR C38, showing the welding done by the TIG method.



Again, the C-38 boiler with the firebox in position. Note the firehole ring has been welded in as has the firebox inner wrapper and firebox backhead.

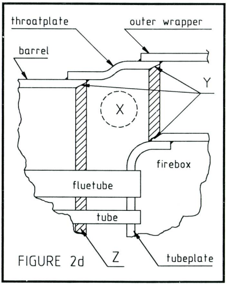


FIGURE 2d

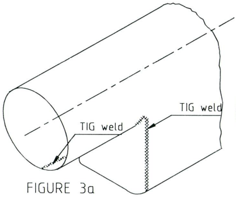


FIGURE 3a

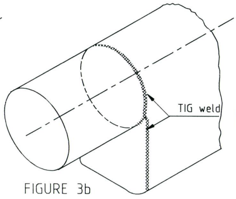


FIGURE 3b

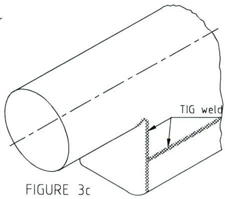


FIGURE 3c

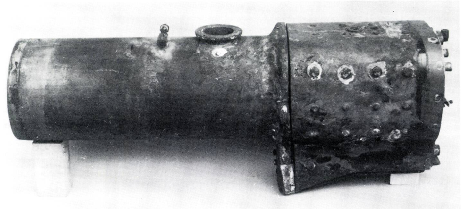


Photo1 shows a scrapped boiler which has been cut through on the firebox side. The cut can be just seen on the firebox side of the throatplate.

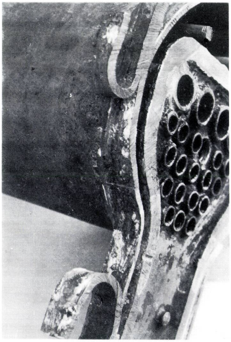
ment of water space as a result of the simple creation of Y. Still looking at the same drawing, you will notice that the boiler barrel has been tapered where it comes through the throat plate. This only needs to be done to the lower half of the barrel for again it is only associated with the easing of water movement. Refer to Figure 2e. Looking back at what we have read and the accompanying illustrations, it becomes quite obvious that welding in this area alone has distinct advantages over other methods of construction. We can make improvements to greatly help steaming capability, but they fall far short of welding.

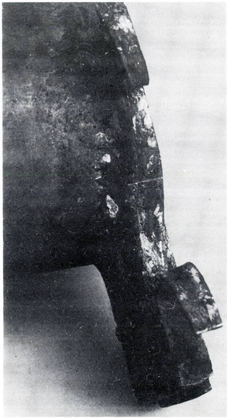
Boilers of *Simplex* and *Blowfly* design, which are sometimes made from a flat sheet or a tube with a full outer wrapper and joined, or a tube opened out with a piece of copper sheet, joined to one side to form the wrapper, are shown on Figures 3a,b and c. The photos of a *Simplex* boiler shows the throatplate weld and of a NSWR C-35 class boiler shows the double flanging of the throatplate welded to the barrel. This shows very clearly the penetration of the weld on the barrel seam and the throatplate. Both these boilers were for 5" gauge locomotives.

A close inspection

At this point I would like to draw your attention to a series of photographs of a boiler that has been in my possession for a number of years. The locomotive came to the workshop to be overhauled and the boiler, after being out of use for some time, simply refused to be steamed any more. Also, a serious leak began to show up at the outer wrapper/throatplate joint. A new boiler was built and fitted to the locomotive. After speculating about what the inside of this old boiler would be like it was cut at the throatplate. The photos reveal a great deal, particularly, how *not* to build a boiler! Despite this, it had done several years of service and it certainly says a lot about the strength of model boilers. The locomotive was a 3½" gauge LMS model.

- Photo 1 shows where the saw cut was made at the throatplate.
- Photos 2 and 3 shows the mass of bronze around the throatplate and on the edge only of the opened up wrapper plate. There was no penetration between the throatplate and barrel at all.
- Photos 4 and 5 shows the almost non-existent water space around the throatplate. It was completely blocked with sediment. Note also the depth that the barrel is projecting through the throatplate — almost touching the firebox tubeplate. Again almost no penetration of the bronze weld.
- Photo 6 is an end-on view of the firebox





Photos 2 and 3 above and right shows where the where the throatplate flange has been lifted away from the barrel, a lack of silver solver penetration at throatplate to barrel.

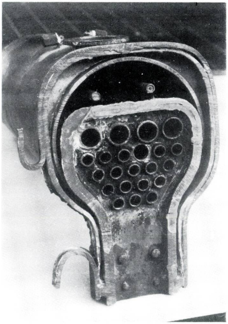


Photo 4 shows very narrow water spaces around throatplate

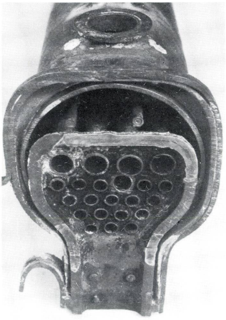


Photo 5 shows narrow water space, especially above the foundation ring area.

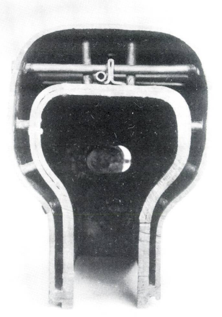


Photo 6 shows the lack of silver solder petentration and thus fusion between the throatplate firebox inner wrapper

assembly. Note again, the lack of fusion of silver solder at tubeplate and firebox wrapper joint. A very clean half-rivet hole clearly exposed.

A very clear view also of the narrow water jacketing around the lower half of the firebox. They are also of dissimilar size and in small areas, particularly when associated with length, can lead to violent water ebullition. This can show up as water movement in the water gauge glass.

Another point worth noting is the lack of a blowdown valve at the throatplate which is the lowest part of the foundation ring. Small wonder that it was blocked up.

Learning from errors

Having pointed out lots of errors with this boiler, I think it is fair to say that we can also learn a lot from it. This is particularly so to people with an inquiring mind.

Tube layout

Earlier I mentioned about altering the tube layout with a view to improving steaming capability. I modified the tube layout in my Stirling boiler and have made similar changes to a great many boilers since. From my earliest days of modeling, I believed model boilers to be over tubed. This was not the case with all of them, but it has been the case with many.

There are various ideas, formulae etc. about this. I have found a tube opening not less than 1/7 and not greater than 1/5 of fire grate area to be quite good.

The object of re-tubing is to increase the opening between the tubes to have more water between them, thereby improving circulation. Having a large water space between the tubes is essential to the free production of steam in conjunction with the free movement of water.

Long before I had as much interest in modelling, I believed that the full size loco boilers had too many tubes. In trying to get every thermal unit of heat from the burning fuel, engineers of the day simply did not think enough of, or perhaps realize what was happening with the water on the other side of the tube. There is much evidence of this from the fact that the tubes that become defective and had to be removed, were invariably badly burnt at the firebox tubeplate. Another point not to be dismissed, was the settling and adhering on, of solid matter introduced with the water in and around this vitally important area. Model boilers can suffer from the same condition — it just takes longer.

Disadvantages of welding

Before moving on, I think it is fair to ask what are the disadvantages of welding. To me — none. Taking all things into consideration, it balances out reasonably well. However, my view is that welding should be done by a welder with Certificate No.7 for TIG welding and especially one who has had experience with copper welding. This is perhaps a large ask, but copper boiler material doesn't come cheap and it is a consideration well worthy of much forethought.

Experimentation

Some years ago I built a wet-back steel boiler purely as an experiment to do some tests and evaluations. It was built from 4 and 6mm steel The foundation ring was 19mm wide and 6mm thick. Working level volume of water was about 12 litres. I will mention two observations from tests with this boiler under steam — for they also concern copper boilers.

- In determining water movement under steam, I would inject two litres of water coloured with Condy's crystals (Potassium Permanganate) into the boiler. Within 30 seconds the water in the gauge glass was starting to colour and in another 30 seconds it was quite purple. In other words, the water circulation was complete within one minute! The clack valve and gauge glass were 760 mm apart. Water certainly circulates fast when unrestricted.
- By measuring the temperature at the front of the boiler barrel opposite the clack valve during injection, I could determine the drop in water temp. It was usually 10-12 degrees. In approximately the same amount of minutes, it would be back to normal. The injected water being very quickly absorbed into the boiler water.

From 12 months experimenting with this boiler, I found a great deal of very useful information, much of which, I have incorporated into the design of subsequent boilers I have built. This has resulted in all these boilers being successful steamers.

Conclusion

In bringing this paper to a close, I hope that I have provided some food for thought about model boiler making.

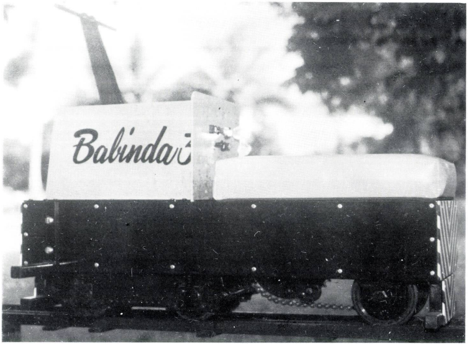
We are now rapidly approaching a new century. Let us not be found wanting by entering it without taking advantage of and making use of the best of the materials and techniques, which have been made available to us in this century.

I passed this article under the nose of the AMBSC Technical Rep before going to print. His comment was: "Everything Dave has said is quite correct, and I'm especially glad to see some proper info about circulation being discussed. My only suggestion would be to modify one sentence under the sub heading of ***Disadvantage of welding*** *to read... However, my view is that welding* *must be* *carried out... instead of 'should be'. Under the Boiler Code the boiler inspector must be aware of the welder's qualification and experience details before welding is carried out".... bmc*

Babinda 3 — a Hand Trolley

by Peter Lukey

Over the past three years I have been building a small 3½" and 5" gauge railway in our back yard [*see AME issue 71, March-April 1997 page 36...ed*]. Here, I should say that our backyard is situated on the industrial estate owned and occupied by the Babinda Sugar Mill in far north Queensland. As I am not going to have a completed locomotive to run for some time, I thought the next best way to test the alignment and stability of the track was to build a 5" gauge hand trolley.


***Babinda 3** ready for action.*

*Two of the neighbours, Ryan (seated) and Sean, put **Babinda 3** through its paces.*

We have two eager young boys next door who have been watching the progress of construction of the railway with the increasing anticipation of playing trains.

The construction of a hand trolley seemed more appropriate than a motorised unit at present, as the boys can operate the hand trolley with minimal supervision.

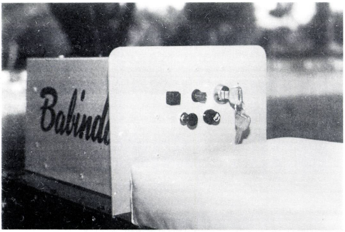
I have a full set of AME magazines which I read through at about three monthly intervals, so of course I remembered the hand trolley described by Ted Murrell, in AME November 1988. Ted's design formed the basis for my own trolley, only mine is 5" gauge.

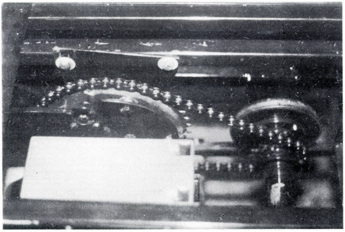
I made a few rough drawings, using ideas from Ted's design and some of my own, for the framework and mechanical components which incorporated standard bicycle parts and commonly used ball bearings.

The frame was brazed up from 20mm RHS, providing mounting structures for the hand lever and countershaft bracket. As the trolley was mainly intended for use on raised track, and as it is a one seater, only footrests were fitted. I did not fit full running boards.

The rear driving axle is to Ted's design, the two driving wheels mounted on a sleeve with a fixed inner axle. A bicycle wheel sprocket was also mounted onto the sleeve. The countershaft crank disc carries a standard bicycle pedal sprocket. The sprocket ratio means the trolley cannot go very fast, but does go fast enough considering that one end of my track has a 6 metre radius around a semicircle.

Continued on page 17...


The control panel.


A view from below showing the battery location.

Steam Chest

with Dave Harper

Hi there, steam fans, and welcome to another collection of steam stuff. I'm not sure how coherent this column is going to be as I've just returned from a wonderful trip around North Queensland as mentioned in last issue. I've just received the photos back from processing, — all ten rolls of them! I have been going through them and re-living the whole trip.

Needless to say there's enough steam engines in there to keep this column going for ages, look for the sub-heading *Travels with Kenny*.

First off, though, there's been some very welcome feedback on the Still engine mentioned a couple of issues ago, as well as a bit more on the radial steam engine article from co-author Don Payne.

Don sent me a copy of an article published in the English *Model Engineer* of 1 December 1955 called *Jet Propulsion 1866* by C. E. Page. It is about HMS *Waterwitch* (mentioned in the radial engines article) and has engravings of the ship and the propulsion system which was apparently to Ruthven's patent design. Thanks, Don, for an interesting reference which I'm sure many readers will follow up.

Still more on Still

The feedback on Still engines came from Roland Border of Brisbane who sent me details of the twin screw motor liner *Dolius* built for the Harold Holt shipping line in 1924. The two 4-cylinder engines each developed 1,250 bhp at 120rpm.

They were normal engines mechanically with piston rods, crossheads and connecting rods etc. The top side of each cylinder constituted a two-stroke cycle port-scavenged diesel engine with airless injection of the fuel, while the lower side of each cylinder was a single acting steam engine and these lower sides were used for starting by steam. Steam power was also used for manoeuvring. The steam cylinders were provided with an interesting form of hydraulic valve gear and the aftermost cylinder acted as a high pressure cylinder, the other three as an intermediate pressure stage, and before being condensed the steam was used to drive the steam turbine driven scavenging air blower; an electric motor drive was also provided for emergency use.

This excerpt is quoted verbatim for the copy which apparently came from a book called the *History of Motorshipping* published in 1955. As Roland said in his letter, it is interesting to note that the diesel side piston crown with deflector follows the classic early two-stroke petrol engine design. This would limit the compression ratio and hence the diesel side efficiency, at the same time providing more waste heat to recover. One could say with confidence that the pre-heat provided by the steam side was necessary for the diesel side to fire. The machinery apparently ran as built from 1924 until it was sunk in the second World War.

It is not recorded what the ship's engineers thought of the system! Inevitably the economy was achieved only through considerable complication which must have given the engineers many headaches!

Daryl Donahoe of Nambour also sent me some information on the Still engine, from Duncan's *Steam and Other Engines* 1958 edition. There is also a reference to the *Proceedings of the Institute of Mechanical Engineers* of March 1925 if anyone has access to these, found in most University libraries. I also found reference to the Kitson-Clark experimental Scott-Still locomotive. Basically it said that the loco became so expensive and complicated that it ended up bankrupting Kitson-Clark's!

Thanks, Daryl and Roland for your interest and assistance. I think that's enough on the Still system for now.

The Sampson crossover valve

Due to being away for two weeks and sundry other distractions, I'm afraid the promised details of the cross-over valve pump aren't ready yet. However, Ken tells me that he is building a refined version to fit on a Westinghouse pump and that we'll have that drawn and photographed for next issue, hopefully!

Meantime, here are a few photos of an earlier version that Dave Sampson built using the more conventional reversing valve and shuttle valve system. The scales in the photos are millimeters, and shows why I call Dave's models steam watchmaking! They also gave my macro lens a good workout!

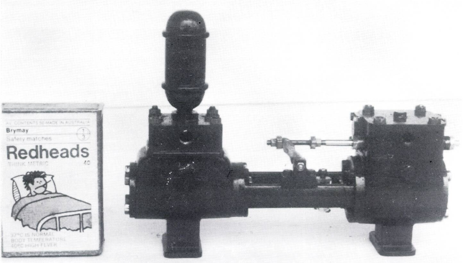


Photo 1.

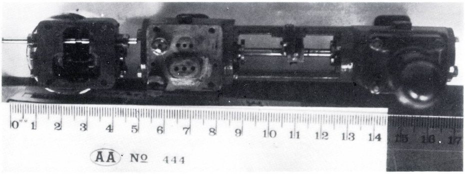


photo 2.

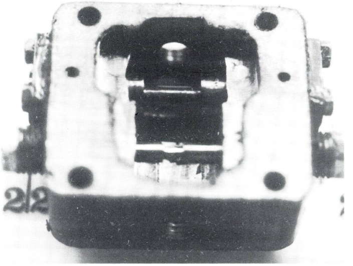


Photo 3.

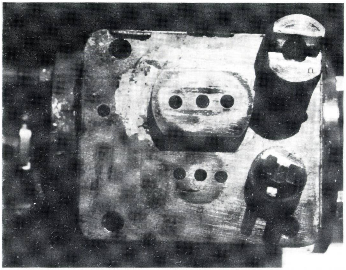


Photo 4.

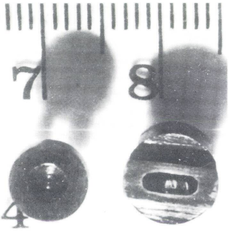


Photo 5.

Photo 1 shows the pump complete and **photo 2** shows it with the steam chest lifted off. **Photo 3** is a close-up of the steam chest showing the push rod and shuttle valve with their cut-outs to receive the valves. In **photo 4** the cylinder block and valves are shown; when the small valve uncovers one port, steam is admitted to the corresponding end of the shuttle valve. This moves over, taking the main valve with it. This opens the steam port to the cylinder and causes the piston to make another stroke. This moves the small valve across and reverses the sequence of operations.

Photo 5 shows the underside of the two valves at three times full-size! This illustrates why we've been working towards producing a larger version that the average model engineer would be more likely to tackle! One thing you have to say for Dave Sampson's models, they're cheap on materials!

QSVS Classic Steam Rally

One of the other things that has kept me (and many others) busy recently was the Classic Steam Rally held at North Pine Country Park on May 31 and June 1. Sadly this year the model steam boaters couldn't make it, so for a change we laid a length of portable 5"g track down the middle of the Boiler House and had some locos in steam all weekend. Ken Saunders and Jim Knapp have our gratitude for organising and transporting the track courtesy of Bribie Island Live Steamers.

Photo 6 shows young James Paliadelis, one of our junior members, who spent all day Saturday steaming up and down the 30ft or so of track behind William Knapp's *Blowfly*. **Photo 7** is of Ken Saunders' 0-6-0 switcher complete with Sampson valve on the Westinghouse pump!

Outside, we had several new items on display; **photo 8** shows Dennis Alchin's little vertical steam engine with it's Jacko boiler mounted on a transporter. Dennis' son found it made a handy dining table! The engine is a bit of a mystery, anyone any ideas what brand it may be?

Photo 9 shows old friend Ray Schilling who has recently moved down from Nanango to quite near Petrie. He has also joined our

Photo 6.

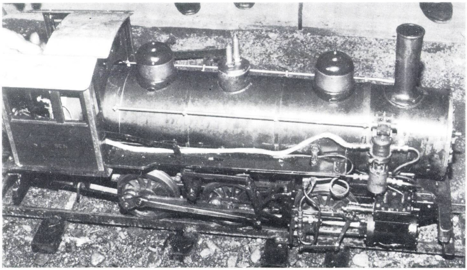


Photo 7.

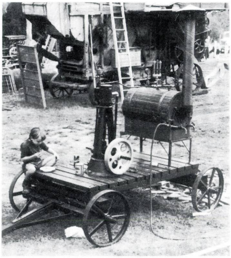


Photo 8.

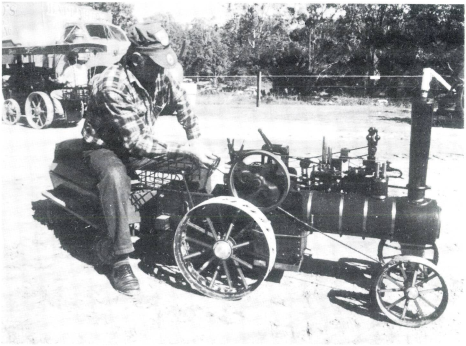


Photo 9.

society I'm pleased to say. Ray was driving his 3" scale Cliff and Bunting traction engine.

Photo 10 is a classic, I reckon — Bob Bone turned up with his beautiful four-in-hand Clydesdales and was wondering where to take them. I offered to guide him round and was promptly invited up beside him. This was the view we beheld, traction engines everywhere! I thought the horses may be put off but Bob assured me they'd be okay, so when a clear path appeared, off we went, no trouble, right through the middle!

Another welcome visitor was the Allchin TE of Malcolm and Shane Lyell, founder members of our society now becoming involved again.

Reg Schuster from the Gold Coast bought two new engines for our rally; a neat little steam shearing plant by Pratchitt Bros of Carlisle (**photo 12**) and the lovely little Ruston Proctor showman's road locomotive in **photo 13**.

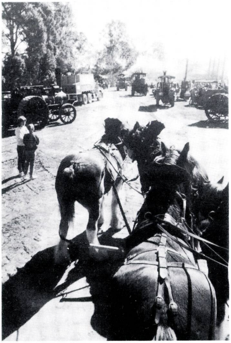


Photo 10.

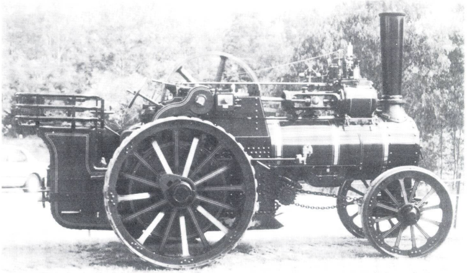


Photo 11.

All these and many more made for a very enjoyable weekend, and I've no doubt that we'll be doing it all again next year!

Book rave

I haven't done a book review for a while, but the book I've just acquired deserves raving over, read on! Through my membership of the Newcomen Society I received notice of a book being published by the Institute of Mechanical Engineers to celebrate their 150th anniversary. Called *An Engineering Archive* the book contains a selection of papers published in the Proceedings of the Institute of Mechanical Engineers between 1847 and 1947.

The first paper was written by their first President, George Stephenson, and as I read the list of other papers to be included my wife really thought I was going to blow a safety valve or something! Even the price, at 59 pounds sterling plus 10% freight didn't slow me down much, as I figured I could twist my dear son's arm to buy it for his Dad's birthday, Father's Day, Christmas, who cares?

Anyway, the deed was done, and the book arrived while I was away up-country. I've been working my way through it since returning, to the detriment of this column's deadline, and it really is a classic. It's a mighty tome, about 300mm x 215mm and about 45mm thick, 630 pages of quality paper, nearly 30 papers reproduced just as they were printed in the Proceedings, complete with drawings.

If you're interested, contact Mechanical Engineering Publications Ltd,. Northgate Ave., Bury St Edmunds, Suffolk IP32 6BN, England. Phone 01284 76377, fax 01284 704006.

Travels with Kenny — a foretaste

One of the major items we wanted to see on our travels was the Hathorn Davey differential pumping engines at Charters Towers. Thanks to my good friend Owen Peake of Darwin I have quite a file of information on these unique engines. Here's a copy of the drawing which I believe Owen and his associates prepared from their survey of these engines some years ago. As you will see, these engines are distinctly different, and I'll be attempting to explain them in due course!

Till next time — happy steaming!

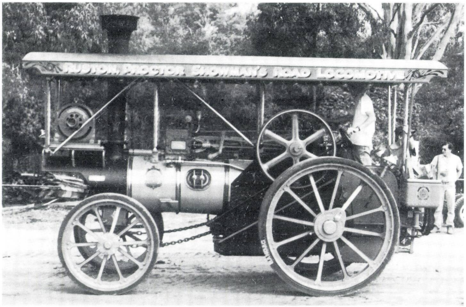


Photo 13.

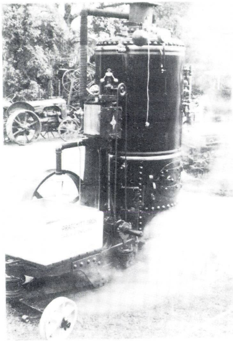
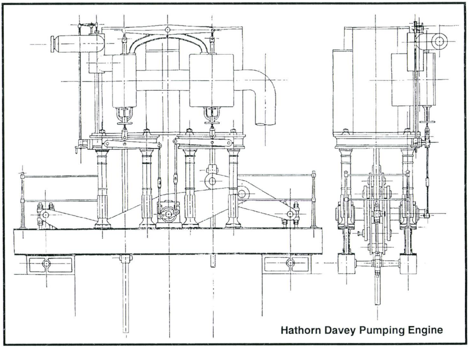


Photo 12.



Hathorn Davey Pumping Engine

***Babinda 3** continued from page 13...*

In view of this tight radius I provided a bogie front end to gain flexibility. This has meant more work and added to the weight of the trolley, but has given it the ability to follow the lay of the track.

The bogie is a 5" gauge version of LBSC's *Tich* driving car design which I find well and stable under my own 3½" gauge trolley. It is fitted with individual axleboxes and springs and I think the most important feature to stability is that the turntable face is situated below the main axle centres.

The turntable consists of a plate mounted between the bogie frames, on which two vertically mounted ball bearings run, providing jam free rotation. A centre pin with a nut and washer locates the bogie.

The body work is aluminium sheet pop riveted to the steel frame. I made no pretence of covering up the pop rivet fasteners used, other than to paint them over at a later date.

The bonnet was crudely shaped on the lines of Babinda Sugar Mill's latest locomotive, a Bo-Bo Hunslet design by Bundaberg Foundry. The paint scheme was also copied from the same locomotive. The seat upholstery is made of tarpaulin material and was done professionally at little cost.

The name on the sides of the bonnet, with the addition of the number 3, reflects the third locomotive, if the hand trolley can be called one, now running on the mill site and carrying the name *Babinda.*

From the photographs it will be seen that the trolley has a control panel. This is to help make believe for young drivers in providing the diesel sound, head light, tail lights and horn. I have also added a key switch which will turn on the diesel sound.

The diesel sound will be synchronised to the speed of the trolley via a proximity switch picking up off the teeth of the larger sprocket. A Dick Smith diesel sound electronics kit will be installed, driven by a tachometer circuit to convert pulses into a varying voltage. A 50 mm loud speaker will produce the diesel effect. I am still searching for a suitable electronic horn sound circuit to run off 12 volt dc. The whole system will be run off a 12 volt gel cell battery. Details of these additions will be presented at a later date when proven to work.

All in all, the hand trolley was a fun machine to make. I am sure children will enjoy using it to play trains with. In the end, isn't playing trains what we all enjoy?

Thanks to Ted Murrell for his Trolley article and thanks to AME for publishing it.

A Guide to Metals for the Model Engineer

Part one — The steels

by Ken Daley

Congratulations! you have made the decision to start building that model, now comes the time to select the materials. When you have a choice of known type and grades of material, a little bit of knowledge about the material characteristics can make the job a lot easier with much less chance of it ending in the scrap bin. Model engineers are renown as the worlds greatest scroungers and recyclers of materials, sometimes you have no idea of the material grade, but knowing what product the material was originally used for can give you a fair indication of its properties. From a Model making point of view metals may be divided into two main groups, (1) ferrous (steel and cast irons) (2) Non-ferrous (copper and alloys). In this part we shall look at steels.

Boiler builders note!

Please note that before using any steel (or coppers) for a boiler application, you must check that it is an approved material as per AMBSC code Part 2 (Steel Boilers). If in any doubt, check with a AMBSC boiler inspector first.

Selection of types

Choosing steel from your local supplier is not like choosing a piece of timber. With timber a quick look at its colour and texture will almost certainly tell you what species it is. Unfortunately looking at a piece of un-machined steel will not readily identify its grade. Grade you say, does steel come in different grades?

Yes! steel most certainly does come in different grades, and these grades have different applications the same as timber does, for example in Victoria we use redgum for railway sleepers not because of its colour but because of its strength and resistance to decay. We chose a steel for its attributes, be it strength, weldability, machinability, raw shape or some other attribute. A hard steel is not always the best choice for the job; for example a steel used for a drill bit would make a poor nail because it would be brittle if a side load was applied to it. Where as a nail would be too soft to make an effective drill bit. Our selection of a steel for a given task is based upon the usage of the end item, not all steels are readily weldable, not all steels are suitable for forming (bending), not all steels can be hardened by the average model maker.

Sizes and grades

If you ask your steel merchant for a bar of 1" by ½" mild steel, the response will most likely be: "you mean 25mm by 12mm AS3679/250 in a standard length of 6 Metres".

Lesson one: steel comes in metric sizes!

Lesson two: the specification is governed (in most cases) by an Australian Standard some of which are:

- AS3679 / Square edge flats — hot rolled (black) Grade 250
- AS3678 / Low Carbon plate (6mm onwards)
- AS1074 /Pipe (black) Grade 200
- AS1163 / Pipe (black) Grade 200
- AS1163 / Tube Square Grade 350
- AS1548/ Steel plate for boilers and Pressure vessels

The grade is the nominal yield strength in Mpa (i.e. Grade 250 has a minimum yield strength of 250 Mpa). Please note that before using any material for a boiler application, you must check that it is an approved material per the AMBSC code Part 1 (Copper Boilers) or Part 2 (Steel Boilers). If in doubt check with a AMBSC boiler inspector first.

A definition of Yield strength for the model engineer, is "the maximum stress (load) that can be applied without permanent deformation to a test piece".

Steels are classified on the basis of the percentage of carbon and other alloying elements present. The basic groups are:

- (1) *Mild steels*: containing between about 0.15% and 0.25% carbon, are used where moderate strength and good weldability are required.
- (2) *Medium Carbon Steels*: containing between about 0.30% and 0.60% carbon these steels have higher strengths but reduced weldability.
- (3) *High Carbon Steels*: contain up to 1.5% carbon; they have poor weldability but can be heat-treated to increase hardness and toughness.

For plate material (above 6mm) Grade 250 is the " normal Mild Steel" Grade 350 is still a mild steel but is about 40% higher in its yield strength.

Many model engineers do not realise that steel has a grain similar to timber. When a steel plate is rolled then the length becomes the longitudinal grain direction, the width is the long transverse grain and the thickness becomes the short transverse grain direction. Grain direction can be very important when forming heavy sections, the recommendations in the case of grade 350 plate are, up to 10mm (3/8") thick, cold forming of radii of not less than three times the material thickness can be made in the longitudinal direction, but not less than two times the material thickness in the long transverse direction without the risk of cracks forming.

Available grades

For black round, flats, angles, channels and beams the most common grade will be AS3679-250. In the case of round, square or hexagon shaped bars "bright bars" i.e., they have been cold drawn through a die to achieve their size, then the most likely grades available are CS1020, CS1030, S1214, S12L14 and K1040

Now you really are confused about these numbers, so let us work through this specification number. A four digit numeral series is used to designate graduations of chemical composition in carbon and alloy steels. For example all carbon steels being with the numeral 1, and the last two digits indicate the approximate carbon content, for example:

- 10xx Non-resulphurised carbon steel
- 11xx Resulphurized carbon steel
- 12xx Rephosphorized and resulphurized carbon steel

In alloy steels the second digit indicates the approximate percentage of the main alloying element and the last two digits indicate the approximate carbon content.

For example:

- 41xx Chromium 0.50-0.95 Molybdenum 0.12-0.30
- 43xx Nickel 1.83 Chromium 0.50-0.80 Molybdenum 0.25
- 86xx Nickel 0.55, Chromium 0.50, Molybdenum 0.20.

Any alpha code indicates a particular characteristic of the steel: C = carbon; S = Sulphur; L = Lead; K = Killed (refers to the uniform chemical composition).

Characteristics

The addition of sulphur or lead will improve the machinability of the steel, but there will also be a proportional increase in the price. The mechanical properties of leaded steels fall within the same properties range of steel without lead, for all practical purposes they may be considered to be the same.

- Hardening
  Steels with a carbon content greater than 0.30% can be hardened by heat and quench methods. Steels with a Carbon content of less than 0.30% can only be hardened by a induced Carbon to the surface (case hardening) process.
- Welding
  Steel with a carbon content greater than 0.30% is not suitable for welding without special pre or post heating. High tensile nuts and bolts usually contain 0.4% carbon.

Steel with a sulphur content greater than 0.05% are not suitable for welding as both porosity and cracking can occur. Some manufacturing data will speak of a Carbon Equivalent, this is used as a measure of the weldability of a steel, its value is calculated from the following formula:

$$CE = C + \frac{Mn}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Ni + Cu)}{15}$$

However, my advice to the model builder is not to weld anything that requires pre or post heating or the use of special electrodes unless you have thoroughly researched the implications.

The common steels

Some examples of common carbon steels, their uses and properties are:

- CS1020 (0.20% carbon steel) good forming capability, easy to weld, case hardening grade, general engineering use, fabrication, fasteners etc.
- CS1030 (0.30% carbon steel) easy to weld, better machining characteristics, not as "gummy" as lower carbon steel, typically used for levers or parts required to be a little tougher than CS1020.
- S1214 (Rephosphorized and resulphurized) S1112 "free cutting" steels intended for those uses where easy machining is the primary requirement. The higher sulphur content results in some sacrifice of cold forming and weldability. (see previous note on welding).
- S12L14 (Free cutting - leaded - low carbon steel) excellent machining, often used by model engineers when a high surface finish is required. Not really suited to welding as the welds tend to crack in use.
  These are generally the "bright" bars or from some merchants they may be available as "ground diameter". For a given material, black (hot rolled) will be the cheapest purchase price followed by bright steel and finally ground stock.

Tolerances

If you are planning to build something using finished bar then it could be handy to know what variations (tolerance) you can expect. According to Round Bar Tolerance AS1443-1983 for cold finished bars — annealed or normalised (that means soft not hardened) after bright finishing, the limits in Table 1 opposite apply.

Medium Carbon steels

- K1040 (medium carbon steel) Grades over 0.30 carbon may be selectively hardened by induction or flame methods. Weldable with pre heating and use of "low hydrogen" electrodes, used for axles, bolts and studs or applications required to withstand higher loads.
  This material can work harden with the use of blunt cutting tools. Very popular for chain sprockets as it can be flame hardened.
- CS1040, K1040 or S1045 are popular choices for axles among model builders. These materials offers a higher fatigue life than "low carbon steels" Fatigue failures may occur in components subjected to many applications of a load that is well below that which would cause failure in a static test. In has been reported that fatigue failures account for about 80% of all failures of machine components.
- K1042 (remember 42 = 0.42% carbon) sometimes called Duraflex. If you are after a plate material that is tougher than grade 350 then this a popular choice. But remember that if you flame cut it, you can expect some surface hardening due to the carbon content (0.30% is the magic carbon number).
- K1082S 0.82% Carbon. Used for heavier coil springs.

Alloy steels

Next we tackle alloy steels, up to now I have spoken about carbon steels (those whose four digit number starts with a 1).

- 4140 0.4% Carbon, 0.75%-1.0%, Manganese 0.8-1.10% Chromium 0.15-0.25%, Molybdenum and 0.2-0.35% Silicon.
  The most popular of the low alloy /medium carbon group.
  Often used for forgings, front and rear axles, transmission shafts on full size equipment or applications requiring a high degree of strength and toughness. Not really a steel required by model makers, but if you have the need, then this is termed "medium hardenability" which are usually oil quenched rather than water quenched. (Oil quenching is less severe and produces less distortion). This steel can be through hardened rather than just case hardened, allowing a higher degree of strength and toughness than the "plain carbon case hardened steels".
- 8620 0.2%Carbon, 0.7%-0.9% Manganese, 0.8-1.10% Chromium, 0.15-0.25% Molybdenum, 0.2-0.35% Silicon and 0.4-0.7%Nickel.
  A carburising (case hardening) steel. The well balanced alloy content permits hardening to produce a strong, tough core and high case hardness.
  Often used for end mill adaptors and stub arbors. Can be welded, but pre-heating recommended and stress-relieved after welding.
- 5160 Spring steel: 0.6% Carbon, 0.75%-1.0% Manganese, 0.7-0.9% Chromium and 0.2-0.35% Silicon)
  Used for automotive leaf springs. High yield-tensile strength ratio, excellent toughness and high ductility. Difficult to machine unless it has been annealed (softened). Welding not generally recommended due to the carbon and chromium content, however with the correct welding rods, suitable pre-heating and stress relieving after welding good results can be achieved.

Special steels

These are are generally known by generic names rather than their composition coding, typical examples are:

- Silver steel: used for pins, can be readily flame hardened. Typical analysis would be Carbon 1.1% minimum, Manganese 0.30%, Sulphur 0.035% maximum, Phosphorous 0.035% maximum, Chromium 0.40% and Silicon 0.10%
  Available in both metric and Inch diameters normally 1 Metre (40") lengths
- Gauge Plate: flat ground stock. Typical analysis would be Carbon 0.95%, Manganese 1.20%, Chromium 0.55%, Tungsten 0.55% and Vanadium 0.20% has been used for quadrant plates.
  With the combination of high Carbon, Manganese, and Chromium, these generic named steels will quickly take the cutting edge off your HSS cutting tools if you run them too fast. The final special steel (which is an odd one), is:
- MAK-A-KEY: Steel key stock — squares and flats.
  A cold drawn steel (grade unknown) with a tolerance on both dimensions in the order of +0mm to +0.05mm (0.002") for press fit applications. Normally comes in a 300mm (12") standard length.

Bright Steel			**Ground Steel**		
Diameter Over (mm)	**Up to and Include (mm)**	**Limits of tolerance (mm)**	**Diameter Over (mm)**	**Up to and Include (mm)**	**Limits of tolerance (mm)**
0	6	+0 -0.13	0	25	+0 -0.-13
6	22	+0 -0.15	25	50	+0 -0.025
22	50	+0 -0.20	50	100	+0 -0.05
50	100	+0 -0.25			

Table 1.

Continued on page 22...

Miniature Railways and Legislation

by Warwick Allison

"Sit up straight, don't lean over and keep your feet on the footboards". The guard blows his whistle, the driver acknowledges, releases the brakes then cracks the throttle to ease another loaded train out of the station and onto the mainline.

The running of passenger carrying miniature trains on public and private grounds has been successfully executed for many years. However, the "playing field" is changing — the society we live in is now more litigious, insurance companies now carry out meticulous risk assessment before underwriting any dynamic activity and the various state legislations, which forms the umbrella for our operations has changed in recent years. Warwick Allison explains the new "ballgame", the reasoning behind it and our obligations... ed.

In the running of our miniature railways we try to run a safe operation. But what are our legal responsibilities? It is important to understand the legislation, and the basis for our operations. We need to understand what the requirements are, and what we have to do. Even though it is a hobby and we don't like paper work, the admission of the public to our grounds brings greater responsibilities which need to be acknowledged.

This article will refer to NSW requirements (as at March 1997), with which I am familiar. Other states will have some variances and wherever you operate, it would be worth your while to obtain copies of the relevant acts and regulations and read them. However, the basic principles are the same — which is to ensure health and safety. This paper should give a basic understanding of the requirements.

Obtaining acts and regulations

Copies of the acts and regulations are obtainable from state government bookshops (look in the telephone book). Alternatively, if you have internet access they are available on the World Wide Web. This is a good place to access them as definitions and terms that are referenced to other legislation are linked giving a quick "one click" easy access to understanding! NSW legislation at Internet address *http://www.austlii.edu.au/au/legis/nsw/consol_act/toc.html*

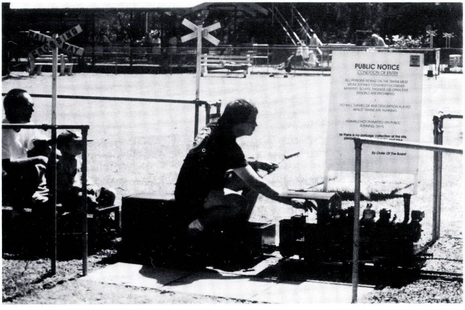
The two acts which we operate under are the Construction Safety Act, and the Occupational, Health & Safety Act. We might also be governed by others, such as the Pure Food Act if you operate a kiosk, but in this article I shall focus on the railway operation.

Function of Acts and Regulations

A short note on authority might be useful. Legislation are Acts of Parliament and are voted on by both houses. When these are passed and given "Royal Assent" (we're not a Republic yet!), they become law and severe penalties are usually provided for those not heeding them. These Acts may authorize the making of Regulations. Regulations are to assist in the application of the Act. These are arranged through the Minister (authorized by the Governor) and are enforceable after being gazetted. They are then tabled in Parliament where either house may pass a motion and modify or withdraw them. The regulations in turn may authorize a Public Servant to make certain requirements or give dispensations. In the case of WorkCover, the Chief Inspector is given these powers in respect to certain matters. What this all means is that some things are absolutely mandatory while other things may be necessary or even waived by the determination of the Chief Inspector.

Amusement device acts

The Construction Safety Act 1912 actually has little of direct impact on miniature railways. The important aspects are fleshed out in the regulations, and many of the powers are similar to the Occupational, Health and Safety Act. The Regulations to the Construction Safety Act (gazetted in 1950) Part 12A Section 157 contain the requirements for amusement devices which cover our operations.



Trains are not the only part of running a safe railway. Approved fencing around the track and clear, succinct signage alerting the public to the conditions of entry and riding trains.

This section covers registration, display of the registered number, the approval of council, the requirement for indemnity insurance, and the need to have approved drivers and attendants. Regulation 5 (Part 1) gives the Chief Inspector the power to grant exemptions (in writing) from the regulations if it is not considered to be practical or necessary for health and safety. Section 157E has design, construction and maintenance criteria. There are some useful pointers in this section, but it needs to be remembered that this act has to cover all types of amusement devices, and an essential requirement for a ferris wheel, may not be particularly relevant for a small gauge miniature railway. Those items that seem most useful include factors of safety for live and dead loads; the space requirement for seating per person; the definition for a persons weight (68 kg); fencing to exclude passengers from dangerous areas; warnings of any potential danger; and the prevention of collisions.

OH&S Act 1983

By and large the most important piece of legislation today in this area is the Occupational, Health and Safety Act 1983. Part 3, Division 1, Items 15, 16 and 17 are the crux of the whole act. These state (my paraphrasing) that the health, safety and welfare of persons is to be ensured by maintaining an environment, plant, and systems of work that are *safe and without risk* (my italics!) and by providing information, training and supervision to ensure health and safety. It is an offense to fail to provide systems that are safe and without risks. This often results in managers today putting in place a safety planning process to ensure some defence in the event of an accident. This is often referred to as "proof of safety". Of course its main function is to prevent the occurrence in the first place.

Other parts of the act ensure that persons must not interfere with anything provided for health and safety, nor hinder any act which would avoid an accident or hinder a request for assistance. Inspectors are empowered to enter the site for the purpose of ascertaining if the Act is being complied with and may issue directions which must be complied with. If they see anything unsafe they are empowered to issue on-the-spot-fines of $50 for operators and up to $500 for owners.

Mandatory notifications

Again there are several regulations to the Act. The OH&S (Notification) Regulation requires the notification to WorkCover of serious injuries (defined as being off work for at least seven days) or of a dangerous occurrence such as damage to a pressure vessel, an explosion or damage to a load bearing member. The OH&S (First Aid) Regulation 1989 requires that first aid kits are available and that a qualified first aider (or nurse or doctor) is to render the first aid. It also requires the keeping of a record of injuries with the specific particulars to be recorded.

HAZARDOUS EVENT	CONTROL
1. Boiler Explosion	**1.1** Construction and operation in accordance with AMBSC boiler codes. **1.2** Competent drivers as permitted by the Track Superintendent.
2. Derailment due to track defect.	**2.1** High standard of track construction. **2.2** Wheel and track standards available and applied. **2.3** Amusement device registration inspection by engineer. **2.4** Periodic track inspection.
3. Derailment due to rolling stock defect.	**3.1** High standard of construction. **3.2** Wheels standards available. **3.3** Periodic inspection.
4. Derailment due to passenger behavior.	**4.1** Video and still cameras not permitted to be used on trains. **4.2** Infants not permitted to be carried in arms. **4.3** Alcohol not permitted in the grounds. **4.4** Guards supervise all trains. **4.5** Warnings to passengers before the train departs to "sit up straight, do not lean over and keep your feet on the foot-boards".
5. Derailment due to points not set.	**5.1** Points interlocked with signals **5.2** Main line points fitted with track locking to prevent operation under a moving drain.
6. Derailment due to excessive speed.	**6.1** Competent drivers as permitted by the Track Superintendent. **6.2** All trains braked. **6.3** Train speeds limited for the track conditions.
7. Collision.	**7.1** Carriage structure protects passengers in front/rear collisions. **7.2** Operating methods designed to minimize exposure **7.3** Interlocking signalling provided at junctions. **7.4** Good visibility **7.5** Low train speed **7.6** All trains fitted with brakes. **7.7** Signallers provide train separation at the station/junction area. **7.8** Operating procedures provide for protection of the train rear in the event of an incident.
8. Passengers falling off.	**8.1** Video and still cameras not permitted to be used on trains. **8.2** Infants not to be carried in arms. **8.3** Alcohol not permitted on the grounds. **8.4** Guards supervise all trains. **8.5** Warnings to passengers before the train departs to "sit up straight, do not lean over and keep your feet on the footboards".

Safe and without risk?

Let's go back to the italicized statement. How do you ensure it is *safe and without risk*? This seems a pretty tall order. Where do you stop? After all it is supposed to be a hobby. Well, the politicians have managed to specifically avoid defining risk. Any risk is seen to be unacceptable. However we all know that life's not like that. It is generally accepted that risk is the combination of frequency of occurrence of an event combined with the consequences. A frequent event with little consequence would be low risk, while an infrequent event with a high consequence could be devastating. Also generally accepted is that any risk must be reduced to a level that is as low as reasonably practicable in order to be a sufficient defence. This, of course, is only finally really decided in court!

Are you good enough?

The demonstrating of compliance with the legislation generally requires that a hazard assessment be performed. The hazard assessment is then assessed as to the occurrence and consequence of the event. This is the risk. It is then necessary to put in place measures that control these risks. We have always done this in the past, (like advising passengers to sit up straight and not lean over) but the current trend is to document this as evidence that the process was conducted and appropriate measures put in place. The measures put in place are often called *controls*. The table shows some typical hazardous events with relevant controls. You might have some different ones, and don't forget it applies to the whole site, so consider items like slippery surfaces, etc. So far so good. But how do you know if it is effective?

Risk assessment

The risks associated with the hazardous events need to be assessed, and prioritized. This is where statistics come in. You already have to keep an injury book. This is the source of your injury statistics. It is also the source for starting with real (instead of perceived) risks. The cause of the injuries recorded should be analyzed and controls adopted to reduce them. This should be an ongoing process! It may be useful to keep an incident book to record derailments, people falling off, etc., for later analysis. The presence of such documentation can also help prove that you have a system in place.

Rear end collisions on a 5 inch gauge railway may be embarrassing but generally have little risk to the passenger. Derailments, however, do present a reasonable risk and their prevention should be the higher priority. If your speed is really low, they might not be an issue. Some particular places might not be good sites for derailments if it means throwing passengers down embankments!

Record your controls or actions at least in your meeting minutes and indicate what is being done and why. Most societies submit works reports to its members and this is an appropriate place. Don't just implement "good ideas". Make sure they properly address a specific safety issue or else your members will wonder what is happening and you can lose credibility.

AALS operating codes

Where do the AALS Operating Codes fit in? Well, these are a guide for what you should be considering. Because they have been put together by the hobby, they could be considered as what is generally considered as reasonable precautions. However with these codes it is not possible to cover the full range of our operations from 2½ inch gauge through to 7¼ inch gauge and so it is incumbent on each Society to ensure what is put in place for them is relevant to the specific site and reflects the actual risks there. The codes will continue to evolve as we become more experienced in these matters. The trend for such documents is that they identify the safety goals we desire without unnecessarily restricting how we achieve them. This means we can each work out our own solutions (if we want to) and by use of risk assessment techniques, provide the proof of safety required.

In conclusion

Only each Society can assess its own operating conditions and the risk associated with it. Be sensible, work on the priorities, back up with good documentation and keep your records for future reference.

***Guide to Metals** continued from page 19...*

Stainless steels

Stainless Steel is a designation covering not just one type, but a whole range of steels. These steels have one vital factor in common - the ability to resist corrosion to varying degrees. Unlike certain other materials, (such as plated or coated materials) the stainless properties are not confined to the surface layer only. They are corrosion resistant through and through and therefore, provided the correct grade of Stainless Steel is selected in the first instance, a very long life can be expected.

The inclusion of Chromium is the principal reason for their corrosion resistance but various other elements are added to individual steels within the Stainless category which produce a wide range of differing properties. An improvement to ductility is made possible by the increase of the Nickel content.

For increased resistance to corrosion in the most severe conditions of service, Molybdenum is added. Higher hardness is obtained by increasing the Carbon content, although a point can be reached where greater hardness can only be achieved by some loss of corrosion resistance.

Stainless steels used in a domestic situation (such as saucepans) are often referred to by two numbers such as 18/10 the first number is the percentage of Chromium (18%), the second is the percentage of nickel (10%) which have been added to the original low carbon steel. These steels are the from the 300 series Austenitic stainless steels group. They are not hardenable by heat treatment and are non-magnetic. The 400 series contain both hardenable (martensitic) and non-hardenable (ferritic) steels, both types of these 400 series are magnetic.

In general most merchants will offer up to three or four grades of stainless steel depending upon the shape of the material and local demands, the choice is most likely to be made from:

- Type 302 Carbon 0.15%, Chromium 16-18%, Nickel 4-6% and
  Manganese 7.5-10%.
  General purpose — excellent deep drawing and cold forming properties.
  Readily weldable, popular for laundry troughs and saucepans.
- Type 302B same as type 302 except additional Silicon 2-3%
  Silicon increases the resistance to scaling or oxidation at higher temperatures. Ideally suited to firebox grates. However all Chromium-Nickel grades have a high coefficient of expansion which should be considered in designing. This is a specialist grade and as such may be difficult to obtain.
- Type 303 Carbon 0.15% maximum, Chromium 17-19%, Nickel 8-10% and Manganese 2%.
  Machine Quality — generally available only in bar form, used where extensive machining is involved. Can be welded and polished to a high finish.
- Type 304 Carbon 0.08% maximum, Chromium 18-20%, Nickel 8-12% and Manganese 2% (sheets, rods, welded tube, flat bar, angles and round welded tube).
  Can be welded in thickness up to 12mm without subsequent heat treatment unless it is required for stress relieving purposes.
  Also suitable for deep drawing spinning etc. Commonly used for threaded fasteners, hinges, circlips and split pins.
- Type 310 Carbon 0.25% maximum, Chromium 24-26% and Nickel 19-22%.
  The highest heat resisting qualities, resistant to oxidation at temperatures up to about 1,000ºC.
  Difficult to work with due to the very high chromium and nickel content.
- Type 316 Carbon 0.08% maximum, Chromium 16-18%, Nickel 10-14% and Molybdenum 2-3% (sheets, rods, flat bar, angles).
  Used for severe corrosive conditions such as marine or chemical applications.
- Type 416 Carbon 0.15% maximum, Chromium 12-14% and Manganese 1.25% (400 series Martensitic-Hardenable-magnetic). Good machining properties
- Type 420 Carbon 0.15% minimum, Chromium 12-14% and Manganese 1.25% (400 series Martensitic-Hardenable-magnetic).
  Used for cutlery, rolled spring pins.

To be continued ...

Lucas C-40 Electric Motors for Traction

by Arthur Richards

Drawing for publication by Neil Graham

There has not been a great deal of comparative information published about the use of wound field motors in use for traction purposes. To fill the void I have conducted tests using Lucas C-40 generators as wound field motors. The following observations are based on the results of my tests.

Shunt V series connected

Shunt connected motors have a completely different torque/speed characteristic to a series connected motor. Shunt motors are generally more suited to constant speed and torque loading and are not satisfactory for overload operation which unfortunately in traction use occurs when they are at their weakest, i.e., at stall.

In shunt connected motors (as in the AME 422 class locomotive) you are paying for the constant field current all the time whereas in series connected motors the armature current is also the field current.

C-40 generators

As generators, the fields rarely handled 2 amperes, and this was only after starting with low battery voltage. The regulator then cuts the field current way down as the battery charges. Also note that these generators run up to approximately 10,000 rpm.

Generators as motors

These dynamos are designed for extremely high output and the field coils operate close to magnetic flux saturation. Doubling the field coil voltage in shunt motor operation will not double the flux, it will only increase by about 30%. So the battery power output is doubled for a somewhat less than doubled output at the motor shaft (see adjacent table). As a shunt motor, with the fields connected to 12 volts (and especially so at 24 volts) there will be a lot of heat generated and this was acknowledged in the 422 class article. However, 12 volts is pretty well useless if you expect a C-40 to give good power.

The better alternative is to convert the motor to a series connected type. At zero throttle, the field current is then zero and only come on as the load is increased. When the throttle is closed the current returns to zero and the heat is dissipated.

Series motor

The method I use to convert the shunt generator to a series motor is to "cut and shut" the existing field coils. What I mean by this is that I tap each coil in half, then halved again and bring the connection ends out external to the motor casing. That means each pole has four coils.

To explain this further, the original field coils have 240 turns of 0.032" diameter wire wound onto a single coil. After modifying, the field on each pole has four coils each of 60

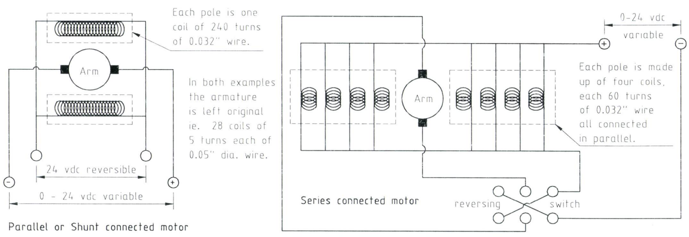
C-40 Motors Comparison Table

Ef	If	Ea	Ia	RPM	T	Ta%	Tb%	Fl
Shunt Connected								
12	2	20	15	2000	9	100%	70%	
24	4	20	15	1400	12.8	144	100	74
Series connected								
		20	15	1700	15	167	115	45-60

where:

Ef	Field voltage
If	Field current
E	Armature voltage
Ia	Armature current
RPM	revolutions per minute
T	Torque in pounds inch force
Ta%	comparative % with 12v fields as reference
Tb%	comparative % with 24v fields as reference
Fl	Heat loss of fields in watts

N.B. There was a 2 volt drop across the fields of the series connected motor.


Each pole is one coil of 240 turns of 0.032" wire.
Arm
In both examples the armature is left original ie. 28 coils of 5 turns each of 0.05" dia. wire.
24 vdc reversible
0 - 24 vdc variable
Parallel or Shunt connected motor
0-24 vdc variable
+
−
Each pole is made up of four coils, each 60 turns of 0.032" wire all connected in parallel.
Arm
Series connected motor
reversing switch
nrg

COMPARISON OF SHUNT AND SERIES CONNECTED C-40 MOTORS WIRING ARRANGEMENT turns of 0.032" (0.813mm) diameter wire all connected in parallel.

The armature is left standard with 28 coils of five turns each of 0.05" (1.25mm) diameter wire.

Some modellers have been know to rip the field coils out completely and rewind new ones with 30 turns of 0.045" (1.15mm) wire. However, I find this to be wasteful.

The C-40 series motor can up to 60 or even 80 volts at proportionately higher revs/min provided the amps stay constant for a given load.

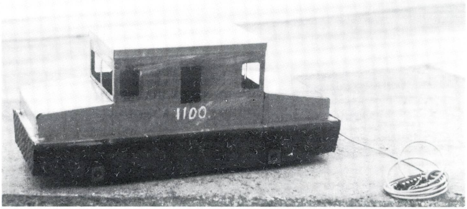
An example

I have an electric locomotive, the outline which is based on the VR 1100 class electrics. The motor in this locomotive has three sets of fields (and an initial resistor) as just described and operates direct from 24 volts through relays and micro switches.

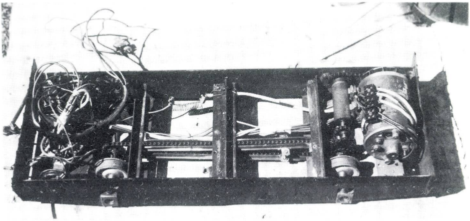
The locomotive weighs 30lbs when empty and 90lbs when fitted with two 50 ampere hour car batteries. It will move 1800 pounds trailing load up a 1:70 grade. With a more normal 900lb load, it draws an average 15 amps and the batteries will last a full day of normal running. Wheel slip is at 32lbs tractive effort.

Conclusion

I hope that this clears up some of the mystery surrounding the use of electric motors in traction duty. Even today in full-size trains, the favoured motor arrangement is the series connected multi pole motor. As an aside, the multi pole motors give about 15% higher output than bi-pole motors.



The author's Victorian Railway's 1100 Electric loco 5"g model almost complete.



This 1988 photo shows the 1100 chassis. In 1992, the motor lay shaft was moved below the motor. The chain is now in line with the drive and the lock chocks have been removed from the axleboxes. I have found that it is not a good idea to use a vertical final drive to the axles as the torque snatches the chain.

Moving Machinery on a Budget

by Don Titus$^{\copyright}$ (USA)

First I want to stress that I am not a professional mover, I'm just a hobby machinist like many of you. The techniques in this article are things that have worked for me in the past. Every situation is different and you will have to determine whether they will work for you. Moving machinery is tricky at best and if your not careful it can be down right dangerous. My first advice is, if you can afford it, hire professional machinery movers!

The search

If your'e like me, you hate to spend a penny more than you have to on unessential when buying tools. Recently I got that dreaded phone call, a friends father was selling his 9" South Bend$^{\circledR}$ lathe in good condition, did I know anybody that was interested? I have been looking for a 9" South Bend with quick change gears for over four years, and I have also come to find that my idea of *good* condition is usually different from others. I am probably more picky then most but cold hard cash comes hard now a days and I want to make sure I get the most for my money. Over the last four years I have looked at over 20 lathes, some looked like they doubled as anvils in someone's shop, others had major parts missing or looked like they were used in "drop tests". The one thing they all had in common is they were advertised as in very good to excellent condition. I decided to take a look, but due to past disappointments, did not get my hopes up. After assuring my wife that I just wanted to see what it was and had no intentions of buying it, we loaded the kids in the car for the two hour drive. It never fails, every time a deal pops up its usually at least an hour and a half's drive away. My wife has kindly pointed out that its because I have bought every good deal inside this radius, but that's another story.

Looking it over

When we arrived we went through the normal introductions, coffee and price before I was taken out to the garage to "look at" the lathe, my wife decided to stay in the house and visit. When it was uncovered I almost could not contain my excitement, the condition wasn't very good or excellent, it was mint! The bench drawers were full of tooling, there was a wooden machinist's tool box filled with Starrett and Brown & Sharp tools, some with their original packing and boxes. At that moment looking turned to *buying*! It was at this point I realized that I was going to have to deal with a two minor problems, the first was convincing my wife that I really had *no* intentions of buying it when we came down and the other was moving it.

Have you ever noticed how the *best deals* always seem to pop up when you can least afford them? Back to the house we went. Somewhere between the garage and the house someone must have painted a sign on my forehead that said "he's going to buy it", because as soon as I walked into the kitchen and sat down I knew she knew, 17 years of marriage does that to a person. We got the terms hammered out and the owners son said he had a skidster (like a Bobcat$^{\circledR}$ with forks instead of a bucket) and he could put it on a trailer for me. Up to this point things were going fairly well but I still had to unload it when I got home. I put money down on it and made arrangements to pick it up the following weekend. I had a week to figure out how I would get it off the trailer, no problem.

Friendly helpers

If you are a novice at buying and moving large metal working tools please bear in mind there is an adverse correlation between the number of friends you will be able to find to help and the size of the machinery. Without fail the bigger the machinery the fewer number of friends that are available and after the moving is done your pool of friends will probably get even smaller.

Early experience

My first venture into moving machinery was a 6" Atlas Lathe, no problem as it would go into the trunk of the car and I could move it by myself. My next venture was a Jet Mill/Drill with stand. I managed to get a few people together willing to help me move a machine that weighed a couple of hundred pounds. After the move I was informed that my weight estimate left a lot to be desired. Next came a vintage horizontal hand mill that I wanted to use as a make shift surface grinder. The company I bought it from sells used equipment and has an arrangement with a local car hauler. He uses a "roll back" (tilt tray) car hauler, the company loaded the machine on his truck and for $75.00 he delivered it to my garage. By rolling back the bed and using the winch on the front of the bed to keep tension on the mill he raised the front of the bed until the mill slid off, smooth as silk. Then we just slid it through the door in the back of the garage where the shop is located. Using the car hauler is only cost effective if the equipment is within a 10-15 mile radius of my home, so I had to rule it out in this case.

Selecting a trailer

I was back to using a trailer and figuring out how to unload it. The trailer part was easy, I rented one locally for $18.00 for the day. I figured the lathe and bench after removing everything from the drawers would be between 600 and 700 lb. so a trailer in the 1,000 to 1,500 lb. range would be sufficient. Over the years I have found it wise, unless asked, not to offer information on what you are hauling to the people you rent the trailer from. They seem to think all metal working equipment weights at least four tons and are usually reluctant to rent you anything less than a trailer capable of hauling a house, at a higher cost of course.

How to unload the trailer?

I still had the problem of how to unload it. The first thought that came to mind was to throw a 4x4 piece of timber over the rafters in the garage and use a come-along or chain winch. After surveying the rafters and knowing full well that if the rafters let go I would not only damage the lathe but might collapse the garage, I quickly discarded this option. I was explaining my problem to some people I know at the local archery range hoping for a solution or the offer of manual labour when one brave sole came forward with what seemed to be a simple and workable solution. He said why not use an engine hoist (floor crane)? He just used one with an extendible arm to pluck the engine out of his 4X4 pickup. He was sure it would work for this as it had a two ton jack and a 1000lb. capability. Most of these have wheels to allow you to move the engine around once it is out of the vehicle, which would make moving the lathe to the shop door a breeze.

The pick-up

Early Saturday morning we were off with the trailer. When we arrived it took all of about 15 minutes to put a tow strap around the lathe bed, lift it with the skidster and set it in the trailer. We covered it with plastic, used tie-down straps to cinch it down tight, said our good-byes and were off.

The unloading

When we got to the house I backed the trailer into the garage and we untied the lathe, then came the moment of truth. We folded the tow strap in half forming a loop and slid the loop under the lathe bed and over the hook on the hoist. Then we hooked the other two loose ends (which have loops) of the tow strap to the hook and slid the strap out as far as it would go. The hoist worked like a charm! We lifted the lathe up just enough to pull the trailer out of the garage and immediately lowered the lathe to within an inch or two of the floor, just in case. The two of us wheeled the hoist and lathe to the door of the shop, set the lathe on the floor and slid it through the door and into place in the shop. I would have used the hoist to wheel it right into place but the door on the shop was to narrow, I'll plan better the next time. It took all of twenty minutes to unload the lathe and move it into place.

Don't worry about the moving

I hope this will help some of you who have passed up equipment because you had no way to move it. As long as you keep in mind the limitations of the equipment you are using you should be fine. To move the lathe the only cost I incurred was the trailer at $18, if I would have had to rent the engine hoist it would have cost me an additional $25 and I could have used it to load the lathe. I found that most places that rent tools and trailers also have the hoists available.

Finding the right equipment

With a little research you can usually find someone who has an engine hoist or knows were to borrow one, especially if they think you are trying to recruit them to lift the heavy end of the equipment. If the machine is to large for the engine hoist, the car carrier seems to be the clear ticket, but make sure the garage door provides enough clearance. Most of the people who own car carriers need to pay the bills and are willing to haul anything legal, providing they don't have to physically lift anything. The person who hauled my mill said he has hauled big bridgeports and lathes with no problems, providing it stayed within the trucks weight limitations. For the folks that have their workshops in the basement or other than on ground level, I would highly recommend contacting your friendly neighbourhood rigging (machinery moving) company. They have the expertise to do the job safely and with little risk to your investment.

Mother of inventions!

Remember the old phrase "necessity is the mother of inventions", well that South Bend Lathe was a necessity and it sure looks and runs great. If I would have had to hire someone to move it, I would not have been able to afford it and for me that would have been a shame. I sincerely hope this starts the wheels turning!

Don uses the American method of describing a lathe size. e.g: 9" is the maximum diameter (swing). The centre height, more commonly used in Australia and UK, is half the dimensions quoted... bmc

Australian Model Engineering

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Hot Pot Run 1997

by Ross Edmondson

Illawarra Live Steamers successfully staged their third annual Hot Pot Run over the Queens Birthday weekend in glorious sunny weather and a great time was had by all. Over the three days there were 41 steam locos and 3 diesels registered, plus a wide variety of rolling stock which made up several consists and a few passenger trains thrown in for good measure. Numerous members from the Sydney clubs attended, along with a contingent from Newcastle. Victoria was represented by six stalwarts who made the journey, they also brought along a variety of rolling stock and locomotives. The AME 422 class diesel was on hand for one and all to admire and drive — it took some prising to get the ILS president's rear end off the drivers seat!

Confusing the visitors

Directional running of the railway was varied over the three days. We had normal running on Saturday, a bi-directional run for four hours on the Sunday. Monday was a reverse run just to confuse the visitors — and the members!

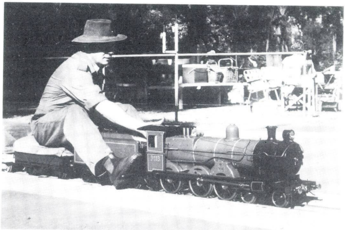
The soup kitchen

The attendance over the three day period appeared to be down on last year's event. However, for those who like to do their sums here are a few vital statistics. The total number of members and visitors tallied up to 413. During the three-day event they managed to devour 940 bread rolls; 280 cans of soup; 9 kilos of butter; ½ kilo of coffee; 5 kilos of sugar; 20 litres of milk, and an unknown number of tea bags. In the aftermath, there were 60 tins of soup left over, and as the Salvation Army Store in Wollongong was gutted by fire the previous week, the obvious choice was to donate the soup to them — it was greatly appreciated by the officer in charge. A letter of appreciation has been received by the club since.

Up the creek

On Sunday afternoon Fairy Creek appeared to be a popular spot for some of the members and the visitors once the novelty of the trains wore off. Fellow ILS member Mark Chapman had two tugboats in action along with fishing trawler Paul Dibden a visitor to the club who had a under control which kept everyone amused for some time. In all, another successful weekend and it will be on again next year. Make a notation in your diary now!

With safety valve lifting at the top of the grade, Dave Smith from Victoria prepares for the descent at the throttle of his QR A10.



Roger Kershaw on board his NSWGR 3403 hauling a mixed goods.

*Mark Chapman's ocean-going tug **Amsterdam** with water cannon blazing salutes Paul Dibden's **Polar**, an Australian fishing trawler.*

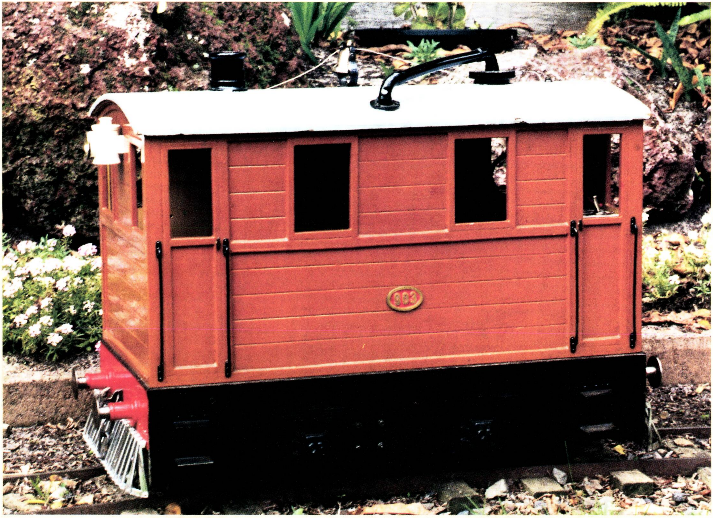
*Ron Dubber on his faithful **Dholpur**. Ron arrived from Victoria on Thursday, set up camp, and eventually left on Tuesday — ask him if he had a good time!*

A Great Eastern Tram

Part 1 of a construction series of a 5" gauge battery-electric powered tramway locomotive

by John Campbell

Photos by the author, drawings for publication by Peter Manning



The tram motor pauses for the photographer while on its rounds.

I had thought about building a simple 5" gauge electric locomotive for a long time and had read many articles on small electric locomotives. In 1990 the stores (scrap box) held a stock of frame steel, castings for wheels, axleboxes, hornblocks and dummy springs as well as a number of sprockets and some assorted lengths of transmission chain and a small 12 volt permanent magnet motor. Together they seemed to meet the requirements for such a project.

The obvious choice of outline became a steam tram based on the small tram locomotives built and operated by the Great Eastern Railway in the flat country of East Anglia.

I already drive an 0-4-2 steam loco which is built to about ⅛ scale and runs on 5" gauge track. It runs well around my small home track with its 3.5 metre radius curves and I built the tram to match.

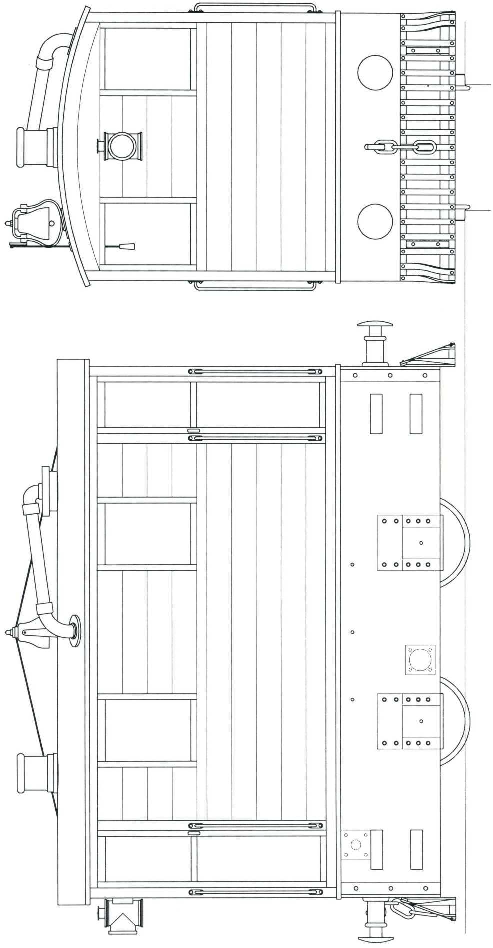
If you are looking for a true scale model or for a loco with lots of grunt, this project is not for you. If you want a simple and safe locomotive for small children to drive and enjoy I can assure you that the tram will be a favourite with them.

The tram's top speed is about 8 km/h and it doesn't like large adults or heavy grades and it may not be able to keep up with the traffic on long club tracks. We do find that at many runs the average speed is about 5 km/h due to stops for passengers, coal, water, oil and just plain talking and the tram is always ready to go. One charge of the car battery will last for an afternoon's running providing there are no trials of strength.

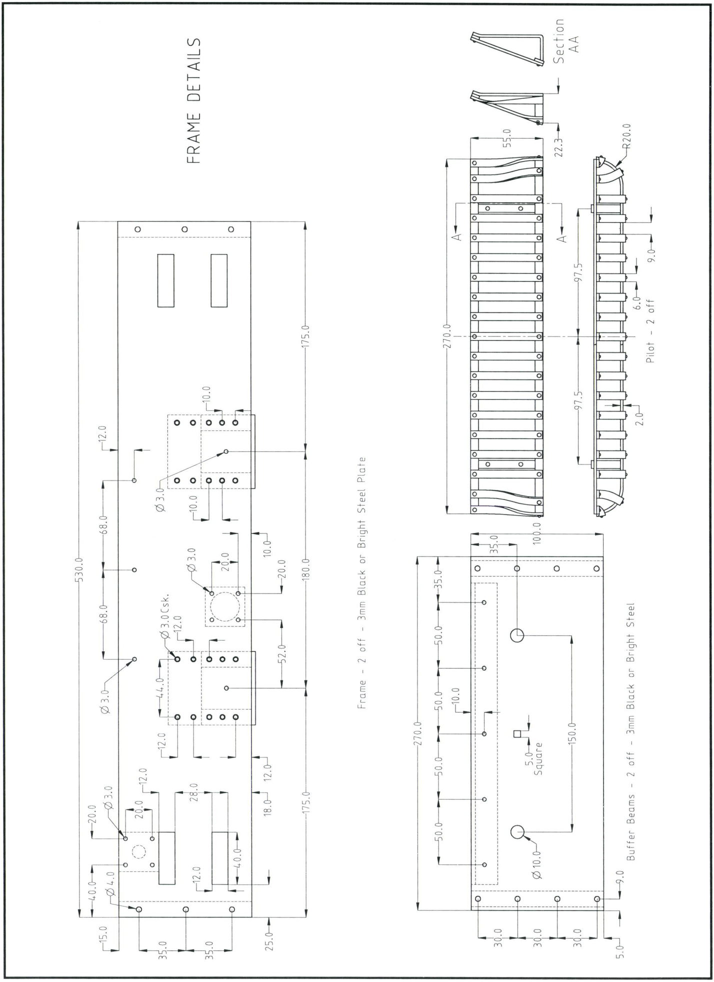
My loco used the wheel castings mentioned and I made patterns for the sides and ends of the body which were cast in aluminium.

The only castings really needed are for the wheels as the body work can be made of wood or sheet metal. My design will be along these lines. The sprockets for the transmission can be made in the workshop. It is more tedious than difficult to make sprockets which are adequate for this light duty.

There are a number of suitable motors available from automobile wreckers. The one that I am using was a blower motor from the air conditioner of a Holden Commodore. This motor geared down 7:1 will easily haul the driver and three children at a reasonable speed.



A GREAT EASTERN TRAM ENGINE


FRAME DETAILS
Frame - 2 off - 3mm Black or Bright Steel Plate
530.0
175.0
180.0
175.0
68.0
68.0
12.0
Ø3.0
Ø3.0
Ø3.0 Csk.
Ø3.0
Ø3.0
Ø4.0
10.0
10.0
20.0
20.0
10.0
20.0
52.0
44.0
12.0
12.0
12.0
12.0
18.0
28.0
20.0
20.0
40.0
40.0
12.0
15.0
35.0
35.0
25.0
Buffer Beams - 2 off - 3mm Black or Bright Steel
100.0
35.0
35.0
50.0
50.0
50.0
50.0
270.0
10.0
150.0
5.0 Square
Ø10.0
9.0
30.0
30.0
30.0
5.0
Section AA
A
A
55.0
22.3
270.0
R20.0
97.5
97.5
9.0
6.0
2.0
Pilot - 2 off

Main frames

The frames are made from 3mm black steel sheet 530mm by 100mm. The buffer beams are also of 3mm sheet, 270mm by 100mm. My frames were sheared from sheet and had some curve and twist which had to be worked out to get the 3mm thick sheet as flat as possible. The flatness of the frames is not as important as in a steam loco but still do your best to get flat frames which will give a good foundation for your work.

Before proceeding very far we will have to know the wheel base which depends on the inter-connecting drive chain. I am specifying standard bicycle chain in this position and 178mm will be correct for this. If you wish to use some other chain you will need to make a trial set up and check the centre distance.

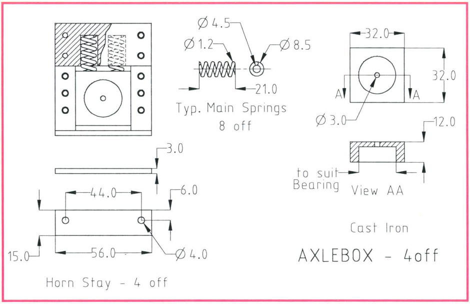
The frames are drilled for the rivets which attach the horns and spring pockets and for the angles to which the floor and cabin are attached. The rivets may be correct iron rivets but I use bullet head nails, 2.8mm by 50mm, and drill to suit. When the nail holes are countersunk on both sides of the work and ground or filed off flush there is nothing to see of them.

The frames are drilled 4mm at the ends for bolting to the buffer beams. There are two other groups of 3mm holes for attaching the motor mounting shaft and the countershaft for the transmission. The position of the countershaft also depends on the chain and again a trial positioning may be necessary. The centre holes in these groups is for location during drilling the holes in the bearing blocks. Two rectangular holes are cut near each end for the steps to the footplate.

Note that the side frames on this version have been set in-board more than shown on the plan. Just one of many possible variations possible.

Axle boxes

The loco runs on ball bearings and it is time to see what you can obtain at the right price. My bearings came from a disposal store and are 22mm outside diameter, 7mm inside diameter, sealed both sides. Any similar bearing will do. If a larger bearing is used you may have to increase the size of the axle boxes and bearing blocks. Six bearings are required. The axle boxes are blocks of metal 32mm square and 12mm thick. My preference is for cast iron, but steel, bronze, brass or aluminium may be used in that order of choice. The blocks are bored a light press fit for the bearings with Loctite® providing an easy cure for a loose fit. While on this job make the similar blocks for the countershaft. These do not move so aluminium is suitable.



Horns and spring pockets

The horns are made from 12mm (½") bright steel bar. Black bar may be used if you polish the bearing surfaces. The horns are 38mm long and should be squared off on each end. One horn is riveted to the frame at each position and the second horn may be clamped against an axlebox with a paper shim while it is drilled and riveted. The spring pockets are 12mm by 25mm by 56mm and may be made of any metal. Two lengths of 12mm square steel would also be quite suitable.

You will need to find eight springs which will support the weight of the loco — about 35 kg. It is not easy to find suitable springs. My springs are 8mm diameter, 29mm long, and have 11 turns of 18swg (about 1mm) wire. This will give you some idea of what you are looking for. Drill the pockets to suit the springs, leaving the pockets shallow at present to allow for later adjustment. The pockets are riveted to the frames.

Horn stays

These are 3mm steel, 15mm by 56mm, to match the hornblock and frame assembly. They should be clamped to the assembly

PULL-OUT SUPPLEMENT: AME'S GUIDE FOR AUTHORS

These notes have three purposes:

- They tell you about how the AME team handles the material you offer for publication.
- They give information that you should be aware of. An important example is about copyright — both in the material that you prepare and in material that you may have referred to when writing your article.
- They provide a checklist of things we like our authors to provide. It' worth going through the checklist to make sure you have not forgotten anything.

We rely on help from our friends

We greatly appreciate the generosity of people who, without being paid, submit items for *Australian Model Engineering*. We consider all suitable items for publication, whether long or short. Our authors contribute to the advancement of our hobby and the enjoyment we derive from it. Without our unpaid authors, the unpaid volunteers who put AME together would be lost!

We give a special welcome to items from authors who are new to model engineering. Many people are interested in reading about how newcomers take a fresh look at projects; and we like our authors to represent a cross-section of our hobby.

We also specially welcome articles from our readers overseas — model engineering is a very "international" hobby.

Before you start to research and write

Although we run on a tight budget, in all other respects we are a professional magazine. Because of this, we sometimes decline to publish a contribution if it does not meet our standards or if it will not hold sufficient interest for our readers. (On the other hand, if an item just needs some more work on it, we have plenty of resources to help you).

To keep faith with our readers, we have to ensure that the model is completed and works well before we publish a long series of construction articles.

If you contemplate writing a long article or series, it's important to contact us before you start, so we can confirm the prospects of being able to publish it and to see if we can help you in any way.

How we handle your item

You can send text by e-mail or by post: details are at the end of this guide.

Soon after your article or item is received, our Article Coordinator will acknowledge it.

The first step we take is to check it against others "in the pipeline" to see whether it has a related subject. If so, we may try to publish the two together (e.g. in a "theme" issue).

The Article Coordinator may contact you about any special requirements that you may have stipulated. Otherwise we will make assumptions described later in these notes.

The item is then sent, as appropriate, for typing, sub-editing and/or draughting.

Artwork is sent away for scanning or redraughting into the style that ensures consistency from issue to issue.

The article will be checked by one of our assistant editors — an experienced model engineer who will look at it from a technical viewpoint. Sometimes we will contact an author at this stage — for example to discuss the possibility of expanding an aspect that we find particularly interesting.

Just before each issue of AME is laid out, articles receive a final copy editing to ensure they are easily readable and that grammar, punctuation, abbreviations and terms are consistent. When the article is ready, text and graphics are imported into page-layout software as the issue is laid out electronically.

The issue is then sent to a bureau for production of film, and sent for printing and distribution.

Normal time-frames

Over all, we need to have enough high-quality articles in the pipeline to ensure we aren't caught short of material ready for publication, especially after a "bumper issue" has come out.

Please don't be perturbed if your article does not appear straight away. Although we sometimes accelerate publication if an article arrives just as we are preparing another with a similar theme, in the normal course of events it will be published after it goes through our sub-editors and draughters with other articles. We are most likely to publish it when it complements other articles to give a nice "balance" (of length and subject) to an issue. This is very important, as we need to meet all the tastes of our readers.

Quite often an article stimulates another idea to be developed, and we will hold it while a related item is written. Sometimes we will hold an article while we obtain manufacturer's drawings of a prototype. This may happen to an article that will appear next to yours, and may therefore hold yours up as well.

We know that delays can be frustrating, but they are inevitable if we are to have a professional, balanced magazine. AME must not only appeal to our regular readers but equally to the increasing numbers of new, casual readers who judge each issue at their news-stand. These casual readers also support our advertisers and help to keep our costs down.

Nevertheless, if you have a special reason for wanting to be published within a specific timeframe, please let us know. We do appreciate that your efforts have been voluntary, and we will do our best to meet your wishes.

How you should write

We like to retain the distinctiveness of our authors' writing styles. Therefore, when writing an item for AME, all you need to bear in mind is to use a conversational style that you would use when *writing a letter to two friends — one experienced and one inexperienced.* Always keep in the forefront the question "What are those two friends going to need from me?" Apart from that, please write in a reasonably informal style that you are happy with.

Speaking of friends, it's always a good idea to have a friend check your article for ease of understanding; we all benefit from "second opinions". And don't forget — we can always put you in touch with someone who can give you some feedback or help in other ways.

How we will edit

AME does not have an imposed, "tight" house style. With most contributions, our editors make only minor adjustments, such as:

- shortening some sentences;
- converting indirect to direct speech ("I made..." rather than "It was fabricated from...") and clarifying any ideas that aren't immediately clear;
- perhaps adding a snappy beginning, to stimulate curiosity; and
- assigning punctuation and abbreviations or terms that match those of other articles.

Some articles require no such editing; others require more "polishing". The AME team has the experience and resources, including professional editing skills, to make AME a "good read" for everyone.

Because AME has an "all-in-the-family" style, we would rather list you in the by-line (under the article's heading) by your preferred given name and surname, such as *Ron Lucas*, rather than as *R. Lucas*. Please provide your preferred name in your article. If you object to that (e.g. you want to be known by your initials and surname, or by an honorific such as The Reverend, Dr, General, Miss), please indicate your wishes on your draft.

You are welcome to enclose brief biographical notes (up to 70 words), which we will publish at the end of the article. This is where we will refer to any special qualifications that you may prefer us to list. A biographical entry could be:

> Fred Moriarty OBE is a member of the Redheap Society of Model and Experimental Engineers. His 5-inch gauge compound 2-10-10-2 freelance Mallet is often seen at AALS conventions. He is a Chartered Engineer, a Member of the Institute of Pyrotechnic Engineers, has a Ph.D. in metallurgy from the University of Addis Ababa, and by profession is an international arms dealer.

If you want to be consulted after the final editing of your article, please say so on the draft that you send us. Otherwise we will only consult you if the meaning of something in your article is unclear, or if we would like you to expand on an idea.

Using other published material

It is the author's duty to obtain permission for reproduction of somebody else's copyright material. Please consult AME if you have any doubts about this matter.

If you want to obtain permission to reproduce something that appeared in AME, please contact the Managing Editor.

Copyright of your material

Please read these notes carefully, especially where they deal with AME's standard policy on copyright: it will be assumed that you agree with that policy unless you specify other conditions (which you are welcome to do).

The following notes are general in nature; they must not be taken as an authoritative guide to any particular circumstances. For further information on copyright, please contact the Australian Copyright Council, Suite 3, 245 Chalmers Street, Redfern NSW 2016; telephone (02) 9318 1788.

Copyright is the protection afforded to the creator of an original work under the Commonwealth *Copyright Act 1968* and through reciprocal arrangements in other countries that are parties to the *Berne Convention for the Protection of Literary and Artistic Works*, or the *Universal Copyright Convention.*

A 1984 amendment to the *Copyright Act* specified that a table or compilation, expressed in words, figures or symbols, including those on magnetic medium, was included in the definition of a work.

Copyright is personal property that can be assigned (sold or given away) either as a whole or as a part interest. The owner can license someone to use it for a specified period or purpose.

Copyright in a literary work (which includes model engineering articles, tables etc) exists from the date of publication until fifty years after the creator's death, or fifty years after publication if the author has died before publication. Copyright in a photograph exists for fifty years after publication.

Copyright protects the original form of expression in a work, but does not protect the ideas or information the work contains. To qualify for copyright in Australia, the work does not have to display "original" ideas, be inventive or of any particular level of quality. Copyright in Australia applies automatically the moment a work is recorded in some way: the work does not have to be published, and there are no registration procedures.

The first owner of a copyright in a work is its author. When the author's creation of a work is not carried out as an employee, and the publisher is not a government agency, ownership of copyright can be as agreed by the author and publisher. Works prepared for AME by non-employee authors, artists and draughtsmen come into this category. In keeping with these provisions, and in the absence of an individual arrangement (which must be a written contract), AME's standard policy on its published works is that copyright is shared between Australian Model Engineering Pty Ltd and the following people, respectively:

- *For an article or other item of text*: the author.
- *For a photograph:* the photographer.
- *For a graphic other than a photograph*: both the person who prepares the original sketch and the draughter who prepares the finished artwork. Each person retains the copyright for the original elements of each drawing. AME's standard policy is to assume that the original artist, when submitting a rough sketch, agrees to the sketch being re-drawn without further reference.

The policy on graphical items is based on the fact that copyright protects the form of expression in a work, but does not protect the ideas or information the work contains.

If you want to negotiate a special arrangement on copyright that is different from the standard AME policy, or you have prepared artwork and want to retain or share copyright relating to its final form, please get in touch with the Managing Editor. Make sure you do this *before* we edit your article or process your artwork. Otherwise, we assume that you are happy with the standard arrangements described in these notes.

Imperial or metric?

Australia and New Zealand "went metric" about a quarter of a century ago. Metric conventions are well established in modern engineering practice. Stock such as tube and sheet is metric. Imperial drills, taps and other tools are becoming more difficult to obtain. Therefore, AME prefers authors to describe all new items in metric units.

Of course, if the story is about full-size machinery that was built using imperial units, then you will probably want to use imperial units.

Despite our clear preference for metrics, we do recognize that many of our contributors are using imperial tools and may not want to use metrics. To avoid errors, we do not convert articles to metric units at the editing stage unless there are only a small number of terms that are not interdependent with others — such as references to welding up 20mm square tube and the like.

Please avoid mixing measurements: try to keep them all metric or (with the exception of metric tube and sheet sizes) all imperial.

What we'd like you to send us

Many people have a well-presented script style of hand-writing that is easy for them to read, but difficult for others to interpret. If you send us your article hand-written, please print clearly unless your normal cursive handwriting is very clear *to other people*. (If in doubt, ask a friend!) Some writing is so bad that our unpaid typists have been known to threaten stop-work action!

If you have access to a typewriter, we would greatly appreciate receiving your article in typewritten form — double spaced between the lines.

Word-processed text

If you have access to a word processor and can provide us with a 3.5" floppy disc, you'll be very popular!

Preferred formats are:

- Microsoft® *Word* (any version). Prepare the article with your word processor, then save it as a Microsoft *Word* file. Name the file with up to eight characters followed by a full stop and "DOC", such as in **MYLOCO.DOC**. (This preference also applies to Macintosh® documents, because we usually read them into a Windows® machine).
- If you can't save a file as Microsoft *Word*, then save in your own word processor file format.
- As a safeguard in text translation, we would appreciate it if you can save the file — in addition — as plain text (ASCII) without

line breaks. Name the file with up to eight characters followed by a full stop and "TXT", such as **MYLOCO.TXT**. (This preference also applies to Macintosh® documents).

On the floppy disc label, please indicate the word processing software you used.

In addition, please provide a copy of your article on paper: if all else fails we can scan it in, and a hard copy is useful for checking.

When formatting a word processor file, do not use any form of page style sheet or page layout: use normal text and left justified.

If you have any doubts about the word processing procedures described, please don't hesitate to ask: we're only a phone call away.

Other electronic modes

AME welcomes material sent by e-mail; if you want to use this mode, please call the Managing Editor to discuss our preferences for attachments.

Do not import pictures or drawings into your text. Keep pictures and drawings as separate files and indicate their location in the text.

Photographs

We can use black and white or colour prints. We prefer not to have slides, although we can use them if absolutely necessary.

The easiest and cheapest to use and process are colour prints. The normal 150 by 100 mm (6 x 4 inch) print size is satisfactory for most work — although an enlargement is usually required for the cover, or for a large body page image. If an enlargement is required, please supply the standard size photo with its negative and AME will arrange the enlargement.

Please enclose captions with your photographs. Do not write on the back of the photo: the markings can show through and spoil it, or worse, the ink could bleed through to the surface of the photo. We prefer you to to write the photo number and caption on a sticky label and attach the label to the back of the photo. Then separate each photo with a piece of plain paper.

When mailing photographs, remember to sandwich them between stiff cardboard pieces, to protect them from damage.

Drawings

Our graphic artists will prepare your illustrations and drawings in electronic form. You only need to provide sketches in sufficient detail and accuracy appropriate to the needs of your article — we do not ask that you provide highly finished, camera-ready artwork.

If you prefer to produce your own drawings for publication, *please talk to us first*. For consistency our draughters follow the AME style guide, depending on whether the drawings will be produced by hand or using a computer.

Your checklist

Please remember to check through these questions before sending your item:

- If I want to be consulted after the final editing of my article, have I indicated this on the draft?
- If I want AME's standard policy on copyright to be varied, have I contacted the Managing Editor and agreed on that variation in writing?
- If applicable: have I obtained permission to use someone else's copyright material?
- If all ideas aren't my own, have I quoted all sources?
- Have I provided my first name as well as my surname? (and, if I prefer, other biographical information as mentioned in these notes).
- If the article is hand-written: is it legible *to other people*?
- If type-written, is it double-spaced?
- If word-processed: have I provided hard copy and a floppy disc, titled as requested in these notes?
- Have I met the requirements for metric/imperial units (especially consistency)?
- Have I enclosed photographs and draft artwork, protected by card, with captions as per these notes?
- Have I included my contact address and phone number (and a fax number or e-mail address if possible)?

Any queries?

Please contact the me if you have any query; we are keen to receive your contribution and will do all we can to make your task easier.

Brian Carter

Managing Editor
Australian Model Engineering
PO Box 176
BUNDANOON NSW 2578

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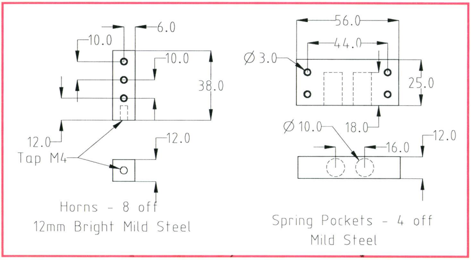
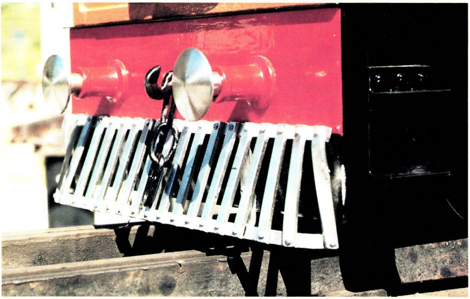
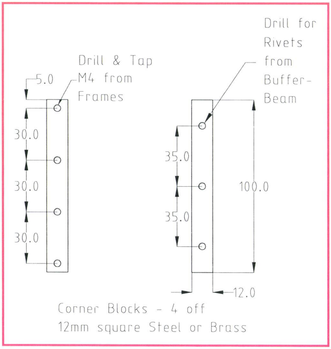
9am–6pm (urgent – mobile/cellphone):	018 022 209
Fax (24 hrs):	(02) 9646 1362
E-mail:	brian@ameng.com.au

* If calling from overseas, replace the (0) at the beginning of the numbers above with your overseas dialling code, followed by 61.





A closer view of the cowcatcher, buffers and coupling arrangement. Note also the changed steps from slots in the frame to the riveted angle iron in the optional recessed frame.



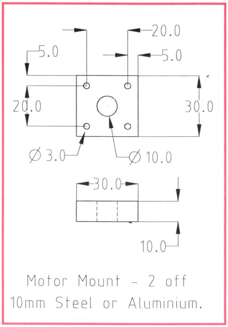
while drilling the tapping size holes in the horns. There are not many holes to tap in this locomotive and it is worth buying good quality taps. You need an intermediate and taper 4mm taps and a 3.4mm drill for tapping. An intermediate 3mm tap and a 2.6mm drill will be needed later. A little screw cutting oil will make life easier and remember to clear the chips when you are tapping blind holes.

You will need some 4mm screws to assemble the frames and I suggest the use of high tensile hexagon head screws. You will need twenty-four 4mm by 15mm screws and the ones used for the horn stays will need to be shortened.

Motor mounts

The motor is suspended from a 10mm diameter cross shaft which is carried in bearing blocks. These blocks are 10mm thick and 30mm square and may be of any metal. The mounting blocks for the motor shaft and the countershaft are attached by 3mm screws and if the nuts are placed outside ordinary pan head screws will be satisfactory. You will need about 100 screws with nuts to suit.

The blocks are located by buttons while the mounting holes are drilled. It is advisable to number each part so that it can it can be easily reassembled.



Buffer beams

As already stated these are of 3mm steel, 100mm by 270mm. They have a 5mm square hole for the coupling, two holes for the buffer stocks and rivet holes for the corner blocks and for the angle iron for attaching the floor and cabin. My buffer stocks are ⅜" diameter and are threaded 26tpi but any near size such as 10 or 12mm will do. When the motor position has been finalized there will be another small angle iron inside the front buffer beam to which the motor torque rod will be attached. The reason for this mounting is to allow adjustment if you decide to change the sprocket on the motor shaft.

Corner blocks

The frames are joined by corner blocks of 12mm square steel or brass riveted to the buffer beams. The main frames are clamped to the blocks while drilling and tapping is completed. Before drilling make sure that the frame assembly is square and level. A good flat offcut of 12mm particleboard will make an adequate surface plate for this task.

To be continued...

Building an Astronomical Telescope

Part 4 — The Primary Mirror continued

by Doug Shaw

If a truly random grinding and polishing technique has been consistently maintained during manufacture of the mirror it should have a spherical curve or figure.

To achieve the goal of a parabolic figure it must now be deepened in the centre by progressive polishing until testing reveals that the figure is correct. Actually the polishing should be stopped when measurements show that we have not quite reached the parabolic form, with the mirror still very slightly under corrected. Such a mirror will approach the parabolic form in practice as the night temperature drops during observing. The fact that the figure changes with temperature brings me to the point that expansion effects are also present during mirror grinding and polishing. They should be allowed for during figuring by permitting the heat generated during the polishing process to dissipate before performing any tests. The mirror should be left for about half an hour to allow stability to be reached.

The figure should change evenly towards the parabolic form if our technique is satisfactory. It is now time to do some calculating to apply the Foucault test which should only be necessary at the centre and outer rim if our figure is regular.

We calculate the distance that theoretically should give us the parabola from the formula: $\frac{r^2}{R}$ where r is the radius of the zone of the mirror to be tested and R the radius of curvature in inches.

In the case of our mirror diameter of 150mm at f/8 the focal length becomes 1200mm and its radius of curvature 2400mm

thus: $\frac{r^2}{R} = \frac{75x75}{2400}$

=2.344mm or 0.0922"

Allow for slight under correction by deducting 0.010" (my guess!). Thus the distance along the mirror axis between the mirror centre to produce instant black out, and the mirror rim to produce instant blackout when the knife edge is introduced should be 0.082".

Should the mirror figure be uneven between the centre and rim it will be necessary to check an intermediate zone as well and bring this to its appropriate distance by selective polishing. Checking the intermediate zone is done by using a mask cut out to reveal only that part of the mirror requiring testing.

To this point I have concentrated on the Foucault apparatus in its application to achieving the parabolic curve however by its use it is also possible to detect local inaccuracies in figure. The "grazing light" effect produced by the knife edge shows up very clearly, otherwise invisible hills and dales and other defects and enables the worker to plan a strategy for their removal. Commercially produced mirrors are usually guaranteed to have an accuracy of $\frac{1}{10}$ of a wavelength of yellow light, this being required for maximum mirror performance. This distance is about 0.000002". The Foucault apparatus in experienced amateur hands will produce similar accuracies.

The finished mirror

Unless the mirror is intended solely for observations of the sun, it must now be made highly reflective. This can be done in one of two ways — by a silvering process or by aluminizing. Silvering is a fairly simple chemical process well covered in the literature and is easily accomplished by the amateur. If it is well done and the mirror properly maintained it should last about three years in an unpolluted atmosphere but will tarnish quickly otherwise. Aluminizing involves sending the mirror to a laboratory but an aluminized mirror should operate well for five years before re-aluminizing becomes necessary. Now, as with most endeavours some of us will be more successful than others, although everything that has gone before should lead to a successful outcome. If however after considerable effort one may feel that his mirror falls short of perfection, this is no cause for despondency because it will probably work very well none the less. How can this be? The answer is that the atmosphere is usually turbulent and will considerably impede telescope performance most of the time and so a first class mirror cannot often fully be exploited.

In practical terms this might mean that a telescope with a technical capacity of 300x magnification cannot operate effectively beyond 100x magnification most of the time. My advice is to do the best you can and enjoy the results which are often in inverse proportion to the magnification anyway, with good images and plenty of contrast at around 50x.

A few wrinkles on the Foucault apparatus

I have refrained from providing details of testing apparatus as this information is available in the literature and model engineers will probable have a few items on their shelves already which can be used; for example a small compound rest, dial test indicator one or two compression springs, odds and ends of brass or steel sheet, tube and so on.

One essential is a longitudinally adjustable screw mechanism and handwheel calibrated in "thous" to allow travel of the knife edge along the mirror axis back and forth about 16mm. If at the same time the knife edge is controlled by a traverse screw arrangement, total control is possible.

I did my work quite satisfactorily on a somewhat primitive device which did meet the afore-mentioned requirement. Having since acquired a Unimat SL lathe I have thought how useful it would have been for Foucault testing and for those with one of these machines I will make a few suggestions.

The lathe itself would be the compound rest and would be mounted on a solid piece of chipboard about 400mm square, with its headstock and motor removed and its bed parallel to the mirror axis. A lamphouse and its pedestal would be made from a piece of 20mm tube about 125mm long and this would be fitted into a base turned to suit the hole vacated by the headstock. The tube would be pierced by a 8mm hole about 30mm from its top end which would be fitted with a cap. Behind the hole in the tube would be a 12 volt 10 watt vertically mounted car roof lamp with its glass lightly ground with fine abrasive. Ventilation holes would be needed in the cap and around the base of the pedestal, which would be arranged so that the light from the lamp was directed towards the mirror along its axis. Pinholes are made centrally in pieces of shim metal by pressing needle points through them. These would be supported in front of the lamphouse hole by a suitable framework to allow replacement for different pinhole diameters as required. I never had much luck making pinholes which would work due mainly to an inability to produce perfectly circular holes down as small as 0.0005" diameter.

I found a very good answer to the problem in my Texereau where a vertical slit is substituted for the pinhole. Use of this method in conjunction with the Unimat lamphouse would probably result in a base for the slit (made from 5mm thick brass or similar) of 20mm x 30mm centrally drilled 5mm. The slit itself is made by using two jaws capable of being fully closed across the hole in the base, when no light is emitted, or eased open perhaps a maximum of 0.050". The jaws would be made from a piece of brass sheet 12mm x 30mm and 2mm thick and cut in half to make two 12mm x 15mm pieces. The edges of the cut would then be cleaned up with a file to produce a true 90 degree angle and backed off 45 degrees from the front to the back edge until a sharp edge resulted. The sharp edge of each jaw would then be dulled perfectly straight with a lapstone. Finally they would be laid side by side on the base with their slit faces touching across a diameter of the hole in the base, clamped and drilled, and the base tapped say 6BA. The holes drilled in the jaws should be oversize to enable some lateral movement for adjustment of slit width. The jaws would then be bolted down ready for action at a separation of say 0.004". Note: if light can be seen between the jaws when closed together they must be trued by further lapping before use.

A framework is required outside the lamphouse so that the slit can be supported and

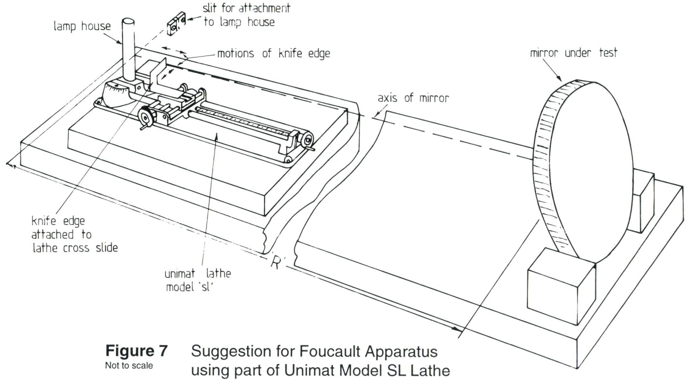


Figure 7 Suggestion for Foucault Apparatus using part of Unimat Model SL Lathe
Not to scale
(hand wheels graduated to read in steps of 0.002 inches)

enable it to be removed at times when it is not required.

Having erected the lamp house, we must now turn to the knife edge and its support. The knife edge would be finished as for the slit jaws, parallel with the slit and at the same height. Its dimensions could be of the same order as the piece of brass from which the jaws were made. If would be bolted to the top of its vertical support bracket with an overhang of about 20mm although this is not critical. The support bracket would be in turn bolted to the top of the cross slide. Figure 7 embodies the foregoing suggestions.

A note on dimensions

The reader will have observed an apparently haphazard chopping and changing between Imperial and SI units, however as most of the literature contains Imperial measurements I have thought it desirable to follow suit so that what I have said should appear consistent with what you may read in the literature.

To be continued...

Notes from the Author

I would like to draw attention to a couple of errors which have slipped into Part 1 (AME March-April 1997). Firstly as camera buffs will know, the "f" number of a lens is simply that — a number. for example on page 2. LENSES, the numbers quoted in the example are 12 and 15 respectively, rather than "f" divided by the number. (see Figure 3), [this error also recurs in Part 2]. Again, in the section MIRRORS Figure 5, there is an omission in that the aberration of rays reflected from the parabolic mirror back to its radius of curvature, (R=2F) are not shown. An analogous situation can however be seen in Figure 4, where reflected rays do not meet at a point but are stretched out somewhat along the axis of the mirror (A - A1), although in this instance the situation at the rather imperfect focus is shown.

Note in reply to comments on cost of mirror blanks, Patrick Barry, Newcastle Astronomical society AME July-August 1997, page 47.

Should there be some who are weighing up the "pros and cons" of tackling a telescope, current prices from local (Qld.) sources for 200mm. diameter Pyrex blanks seem to be of the order of $125 each — remember that two will be required. Some suppliers offer a partial refund on the blank which becomes the tool if this is returned in good condition. Should someone be attracted to the idea of buying a mirror of this size complete — thus deliberately denying themselves a lot of fun! — a complete mirror, ready to go will cost A$312 delivered to the door. According to the latest Australian price list of Meade Instruments Corporation, California. (1 March 1997) and can be ordered by phone direct.

Sir,

As an avid telescope maker, I am currently building a 364mm f/4 for myself and a 686mm f/5.5 as Secretary for the Astronomical Society of Victoria, I was most interested in Doug Shaw's article on telescope building. As Patrick Barry has said, optical glass can be quite expensive, but not as expensive as he makes out. A pyrex disk will set you back $110 for 205mm outside diameter and a plate glass tool for this would cost $48. Carborundum, cerium oxide and pitch would cost between $35 and $50 depending on how much you used or stuffed up!

I have been building telescopes for over 20 years and have now my own mirror grinding and polishing machine as well as a lathe, milling machine, drill press and band saw. Not only do I enjoy optical engineering, but mechanical engineering as well. Due to the incompatibility of optics and swarf I have had to separate out my workshops. One end is mechanical and the other end, separated by a good thick wall and door, with a steel grate for wiping imbedded swarf from my shoes, is my optical shop.

Further information on optical instrument construction can be obtained from the Instrument Making Section of the Astronomical Society of Victoria Inc. PO Box 1059J Melbourne Vic, 3001.

Other places for parts include, Binocular & Telescope Service Centre, (03) 9459 5033, and Mike Smith at the Binocular & Telescope Shop in Sydney, (02) 9262 1344.

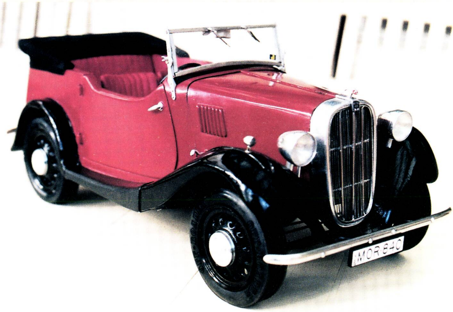
Roger Davis

Director BATSC, Assoc. Editor Amateur Telescope Makers Journal, Manager Association Against Obtrusive Lighting, Secretary Astronomical Society of Victoria Inc.

Morris 840

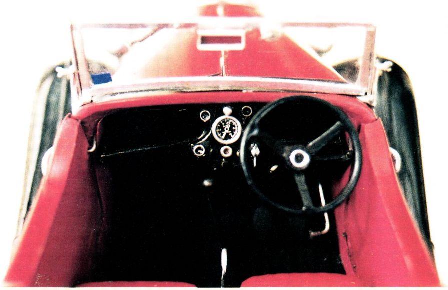
story by Leigh Adams

Photos by Bob Short



Over the last couple of months I have watched modelmaker Bob Short build and develop a model Morris 840. Building mainly from photographs and rough drawings from an old lubrication chart. Bob started where most cars are created from the wheels up. Purchased wheels and tyres from a radio controlled car determined the scale of this unique 350mm long model, everything else was totally scratch built.

Bob's years of work as a professional modelmaker comes to the fore, scratchbuilding from various materials. The chassis, constructed from brass sheet and silver soldered together was the first item developed and on the rolling chassis — the red cedar and brass sheet body slowly evolved. Wooden moulds were carved and fibreglass drape mouldings were taken to form the front mudguards. The body was made as a separate component which can be removed from the chassis — assisted further down the track when the painting stage was underway.



With the two major components in primer, Bob switched his attention to the finer details, bumper bars, lights (which work) and the radiator surround were developed from billet aluminium. The seats carved from timber and covered in fabric to match the original car started to bring the car alive.

Faithful reproductions of the instruments, pedals, handles, badges etc., have created a unique model. The car is to be a gift and will become a collector's item which will be cherished for years to come.

Andy Int

by George Feilen

There is always an advantage in some form of exercise. I have found that for the model engineer, walking has definite advantages — the longer the walk the better!

My latest walking discovery were several strips of metal found at random locations. They turned out to be the brush bristles that broke off a street sweeper. The strips are 2.2mm wide, 0.07mm thick and about 300mm long. They appear to be spring steel. The strips are ideal for small latches and clips. They could easily be used as leaf springs for scale rolling stock.

Post-convention Club-crawl — 1997

by Brian Carter with sections by Ian McArthur and Murray Hill

photos by Brian Carter unless otherwise indicated

The after-convention gatherings are always a special time. You usually get a chance to see more of the local area and some of the the locos in a more relaxed atmosphere. The local clubs usually arrange a time when they will be open for convention delegates to visit on their way home

Before we commence our journey around the Victorian clubs let's revisit the Cobden site for a short historical perspective.

South Western Model Engineers Inc. and the Cobden Miniature Railway

by Ian McArthur

The South Western Model Engineers Inc. (SWME) was formed in 1981 as a small group of model engineers who were interested in model engineering making steam engines, steam locomotives, IC engines and farming models. The first meeting was held at the home of Ian McArthur who is the present secretary of the SWME. This group consisted of model engineers from Warnambool, Terang, Cobden and Colac.

The SWME involvement with the Cobden Miniature Railway began at a meeting at the Cobden Rotary Club in July 1993. Alan Hart was the Rotary Club President at the time. At this meeting a use for the now defunct Cobden Racecourse was discussed. Several members of the SWME were miniature railway enthusiasts and had a railway track around their homes. Alan Hart was a regular visitor to the home tracks. Alan and John Wiggins recommended to the Rotary Club that a miniature Railway track, to be known as Railway Park, could be a viable joint project between the SWME and the Cobden Rotary club.

At a joint meeting of the Rotary Club and SWME members held in July 1993 it was agreed that this was a viable project and to go ahead with the planning, there were two members Kevin Nolan, our present president, and Gordon Rudolph, who are earth moving contractors and both stated that they would be prepared to do the earth works at no cost to the club.

The plans were drawn up and arrangements by the Rotary Club to meet with the Shire of Keytesbury councillors to arrange a lease, conditions of use and financial arrangements. As was suspected the councillors were not very enthusiastic as they did not know very much about miniature railways. It was arranged for councillors and members to visit some Melbourne railway parks and the Wagga Wagga track. This was the turning point. An agreement was made and a loan of $10,000 and grant of $5,000 was arranged.

Cobden Miniature Railway under construction — 1994. The embankment is taking shape.

Photo by Ian McArthur

The trolley and ganger shed from the now disused Cobden railway station was transported to the present site and was the first building on the site.

The design of the track was by John Wiggins and the earthworks were started in February 1994 and completed in about one month.

The station was then designed by Bardaia John and the brick work was by Rick, (Bardia's father) who also arranged for the concrete foundation supply of bricks etc., — all donated! The timber roof trusses, cupboards etc., and the plumbing all carried out by local tradesman, members of the clubs — at no charge.

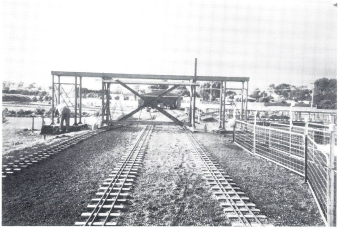
Next was the making and laying of the track. A special saw was constructed to cut the three slots in the timber for the rails. This saw bench, with five helpers, can prepare 3000 sleepers in a day! The 5" and 7¼" track was laid on a scorra foundation and also used as ballast. Scoria is obtained locally from Volcanic Quarries.

The length of the first track was 330m and was officially opened in May 1994 by the Victorian Rotary President with Members of Shire of Heytesbury Councillors and the AALS Victorian Branch President, Murray Hill.

After the enthusiastic opening, work commenced on laying the rest of the track to to a length of one kilometre. The second stage of the track was officially opened by local M.H.R. Mr Stewart McArthur on Sunday 19 October 1994.

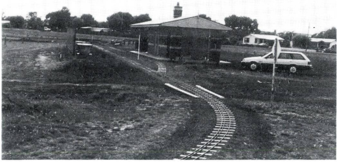
Cobden Miniature Railway under construction — 1994. More earthworks as seen from the incomplete station roof.

Photo by Ian McArthur

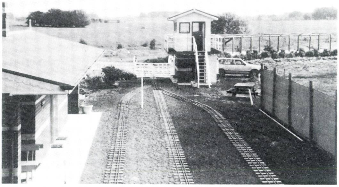


Cobden Miniature Railway under construction — 1996. The overhead foot bridge under way.

Photo by Ian McArthur



Cobden Miniature Railway under construction — 1995
The second track is placed at the station.
Photo by Ian McArthur



Cobden Miniature Railway under construction — 1996
The signal box just completed.
Photo by Ian McArthur

For a period following the opening, the work continued. Trees were planted, the steaming bay and turntable enlarged, and the trolley shed erected. It was then decided that an extra half kilometre loop could be added to the track — this was completed in four months.

David Martin, who moved from Ararat to Cobden, brought with his him 3½ and 5" elevated track which he erected as an oval track in front of the station. Extra lengths of track that had been used around the houses of other members were added to David's length of track. This has now a traverser, steaming bays, water etc. This project was started during 1996 and completed during 1997.

During 1996-1997, one of our members constructed the ground level track traverser for unloading and loading locos. This unit received very favourable praise during the 1997 Convention. Also during 1996 the overhead bridge was made on a member's farm, transported to the site in three parts and erected on site. The Signal box, donated by a Mr B. Sainsbury and family, was erected by members. The water operated signals were constructed by Ron May. The Cobden Garden Club planted the garden beds and around the timber framed tunnel.

Murray Hill had asked the SWME if they would consider the hosting of the 1997 AALS Annual Convention. It was considered that we were too new and not advanced enough in the track facilities. The Rotary Club, when told of this decision, had a meeting with members of the SWME and the joint meeting decided that with plenty of hard work and planning we would be able and capable of hosting the convention. The planning for the convention started in February 1996 with four members of the SWME and four from the Rotary Club.

Monthly meetings were held, local service clubs were invited to help and enthusiasm was generated among all the clubs that this convention would be made a great event.

One of the objects we hoped carry out was to make sure that the ladies and young visitors had plenty of entertainment activities, rest places, also that the meals to be kept to a high standard. The result is that we are receiving letters from clubs all over Australia complimenting us on the success of the event.

The itinerary

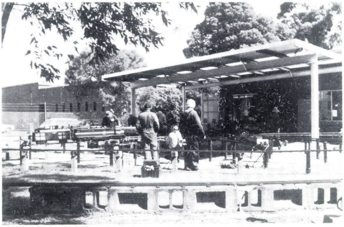
In order to cover the most clubs with minimum travelling, a list of clubs that were on the way home to Sydney was drawn up.

Tuesday :	Morrabbin
Wednesday:	Box Hill
Thursday:	Altona and Bulla (Tullamarine)
Friday:	Euroa
Saturday:	Wandong
Sunday:	Lake Hume and Wagga Wagga.

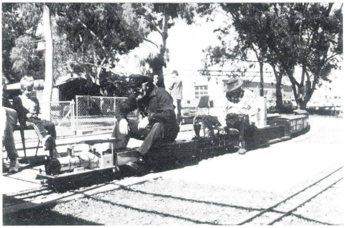
Morrabbin

With the itinerary set we headed off to Steam Locomotive Society of Victoria grounds at Morrabbin. I wanted to visit this club because I was at the 1980 convention there and I hadn't been back since. My recollections had grown very dim. Another reason was to get a first-hand look at the Great Eastern Tram engine which is the subject of a construction article commencing in this issue. John Campbell met me at the track and after a round of introductions, led me to the tram. If anyone is thinking about making one I can tell you from first-hand experience that it runs as well as it looks! My wife also enjoyed a turn at the throttle — so much so that we have one under construction for her use.

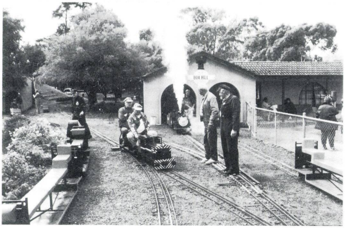
Cobden Miniature Railway under construction — February 1997
The newly refurbished Cobden Railway Station on site.
Photo by Ian McArthur



Roundhouse activity at the Morrabbin track.



Double headed Queensland Railway locomotives hauling a rake of QR wagons at Morrabbin.



The Box Hill club house area — the carriage shed is on the extreme left.

The Morrabbin club members put on a good day with lots of locos, good conversation and good food. About 80 modellers took advantage of the club's goodwill. The track allowed good running as I remembered it from the 1980 convention.

Box Hill

This was my first visit to the Box Hill club. As usual we were treated to warm friendly greetings by the now familiar faces of the conventioneers.

The Box Hill Miniature Steam Railway Society Inc. was founded in 1983. The opening was in 1984 and the first public run was in 1985. The land was originally a flat field! Hard to believe by looking around today. The club had recently commissioned some adventurous landscaping which was still taking shape during our visit. When complete the area in the centre of the land will be a wetlands for native fauna and landscaped with indigenous plantation.

The station building is a replica of the original Box Hill station circa 1910. The club was in the process of replacing the scale aluminium track with a heavier grade scale steel track from Europe. The rail replacement programme is now complete.

The signalling system is based on Victorian Railways practice and the operating equipment is highly sophisticated.

The relatively large carriage shed is well camouflaged by being buried under many tons of earth and appearing to be a tunnel.

I had the opportunity to chat with Alan Williams, a highly active 82 year old who loves railways, flying and theatre organs. He still runs his 5"g 0-6-0. Alan was a founding member of the Puffing Billy Preservation Society in 1955.

A pleasant visit to a very friendly club.

Altona Miniature Railway Inc.

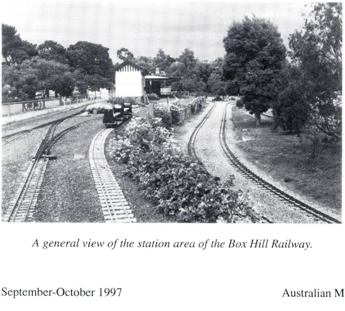
by Murray Hill

The club was formed at a meeting held at the home of Murray Hill on 21 June 1976. Murray had invited a half-dozen fellow enthusiasts who lived in the immediate area of Williamstown to his home. The idea was to discuss the possibility, and desirability, of establishing a new railway club on the western side of Melbourne where no other existed at that time.

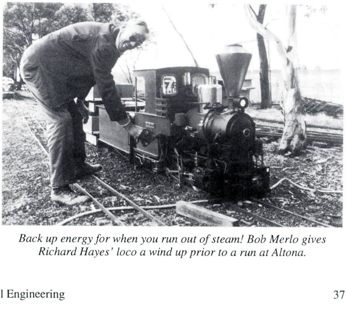
The decision was affirmative, and so began the South Western Railway. Work commenced to seek out a suitable site to build the proposed railway. It was decided from the start, that the railway should be combined 5" and 7¼" gauges, with provision for a future elevated 3½" should it prove necessary. This meant that a reasonably large area of land would be needed to accommodate the proposal as envisaged.

Meetings were held on a regular monthly basis at a number of sites for many years. A portable track of combined gauge with an area measuring 19 metres wide by 34 metres long was built, and used for many years. The track provided the gradually increasing membership with somewhere to enjoy their hobby until a permanent site could be established, and also produced the necessary income.

After many possible sites had been examined and rejected for various reasons, the club finally obtained a lease of the excellent site now occupied, and was granted permanent occupancy of about 8½ hectares. This was celebrated by a suitable ceremony on 20 July 1985 at which the then Mayor of Altona, Councillor W.L.J. Crofts officiated at a handing-over-of-the-lease ceremony. A bronze plaque commemorating the event, was mounted to a large stone on-site and a memorial tree planted adjacent to the stone symbolic of the permanence of the club. The Altona and South Western Railroad was born on a permanent location.



A general view of the station area of the Box Hill Railway.



Back up energy for when you run out of steam! Bob Merlo gives Richard Hayes' loco a wind up prior to a run at Altona.

The Altona club's VR diesel loco with a train load of visitors.

A big cutting at Bulla — you can park a van in this cutting and not see it when standing back from the side!

Progress has since continued. Contractors wishing to dump surplus earth have built many hills on the previously dead-flat ground. Tunnels and cuttings have been built into the hills, and a zig-zag railway to climb to the top is in the process of construction, include grades of up to 1 in 40.

Several condemned shipping containers have been located on site and proven very useful as workshops, carriage storage, and for use as tunnels etc. Likewise, one of the last available V/*Line* goods train steel brake vans was obtained from the railways and located on-site and used as a ticket office, souvenir and refreshment venue.

Much landscaping and tree planting has taken place over the last few years to improve the appearance of the property and to provide wind breaks for inclement weather, and generally make the location more attractive to and enjoyable by visitors.

Present plans allow for a total of three kilometres of track when completed, of which about half is operational, including several sets of points and passing sidings etc.

Public running days are becoming ever more popular as Melbourne residents are becoming aware of the club activities, and many people hiring the site and trains for birthday parties etc. Membership continues to grow with a high level of morale and enthusiasm pervading all activities.

Bulla Hill Railway

I arranged to meet Wayne Roberts at the new Bulla site of the Tullamarine Live Steam Society. A coverage of the new track site appeared in AME, March-April 1997, page 33.

The sight of the machinery creating the trackbed was truly inspiring. Several large bulldozers and diggers were busily filling up several trucks with earth — an amazing sight!

Wayne was helping to mark out the foundation for the clubhouse. Most of the material used to create the new railway comes from the original Tullamarine site.

A phoenix society — rising from the ashes!

We left Bulla and headed north to Seymour where we made camp so that we could be close to Euroa and Wandong.

Euroa

Unfortunately the scheduled opening didn't happen. I phoned Stan Duncan, the Society President, who came out to the track and spent some time talking with me about the club.

The Euroa Miniature Railway and Model Engineering Society was formed about 1993. They spent about twelve months clearing the ground and laying the track. The official opening was in October 1994.

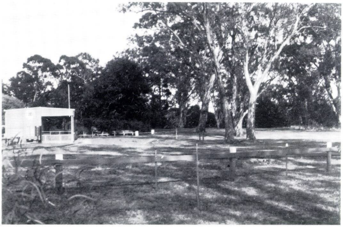
Seymour

Before heading back to Wandong, Susanne and I had a look around the Seymour Railway Heritage Centre. Not quite model engineering — but an excellent research resource for some Victorian Railways locomotives and rolling stock.

Allen Neilson offered to guide us through the exhibits. He was very enthusiastic about the Centre and the exhibits it contained. From steam loco J515 to one of the first flat topped Ts. Some of the passenger rolling stock — *Yarra* in particular — was in exquisite condition after being fully restored.

The Centre is open all day on Tuesdays and Thursdays. Saturday and Sunday mornings. You can contact the Centre at:
PO Box 515, Seymour, Victoria, 3660.
For more information on the exhibits.

Excavation on a big scale at Bulla Hill.



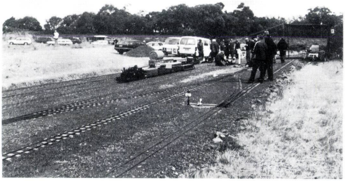
General view of the Euroa track site.

Clarrie crossing the larger Wandong bridge at the "top" end of the site.

Wandong

We were greeted by Nevin Owen, the Secretary of the Wandong Live Steamers Inc. and made most welcome. By this time the convention crowd had become very thin but still going! Some of the Queensland contingent was still around, Clarrie Hough and Jim Palmer with his wife were gradually making their way back north.

The Wandong track has to be one of the most spectacular tracks I've seen! It is situated in an old railway ballast quarry where the ground is anything but flat. The 5" gauge only mainline is about one kilometre long with a ruling grade of about 1 in 38.



A hive of activity at the Wandong track.

A view of the Lake Hume club track and station.

Crossing the bridge at the "bottom" end of the Wandong site.

It is a real driver's track with ups and downs at regular intervals and plenty of curves. The track is elevated a couple of metres at each end of the site for about 200 metres at each location. The height is much greater where the track passes over the stream that passes through the property.

All of the facilities has been financed by the members only. The club has no public running! Given the fantastic but "hairy" ride it's probably a good thing.

The club put on a great sausage sizzle lunch which was shared by the many visitors and members that came up from Melbourne for the day.

Lake Hume

The club opened its track for the convention visitors on Saturday but by the time we arrived on Sunday the fun was over. We decided to continue north to the Wagga Wagga track.

Wagga Wagga

We arrived in plenty of time to join in their running day activities. Here we met up with Paul and Janette Sherman with their children Arthur (3) and Meredith (17 months). The Shermans travelled to the convention from their home in Perth and were working their way north to Brisbane.

It was a pleasant although quiet day at the Willans Hill track, this allowed opportunity for catching up on the latest gossip.

Conclusion

My sincere thanks to all the clubs that opened their doors for the convention visitors. The southern hospitality certainly lived up to its reputation! I'll try and catch up with the clubs I missed on my next visit to Victoria.

Paul Sherman hauling passengers at the scenic Wagga Wagga track.

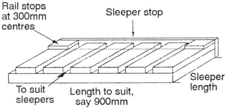
Tracks 'n' Trees

For the Garden Railway Enthusiast

Perway Dept

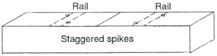
by Gary Warton

Methods for hand spiked track construction. To speed construction I use a jig to space and hold the sleepers. The length can suit your own needs, the width to suit your sleeper length. The width of the rail stops is equal to the distance from the end of the sleeper to the base of the raft in my case it was 20 mm.

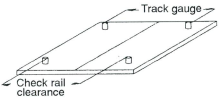


Load your jig up with sleepers, drop a length of rail against the rail stop and spike to the sleeper, staggering the spikes.

Once you have spiked one rail take your track gauge and lay the second rail spiking as shown in the sketch.



Straight track is pretty simple, curve track obviously requires a different jig. You can construct one similar to the straight jig but using tapered spacers between the sleepers and the sleeper stop set to the design radius. I found it hard to keep a uniform curve with that type of jig so I made a different type from a sheet of 12 mm ply. I set blocks of wood to the design radius at the outside of the rail and held one rail to this while I spiked. The sleepers were spaced with pieces of wood, in my case 32 mm wide. I found that using a large jig, mine was 1200 mm long, I could get a uniform curve very easily and spiking proceeded quickly. If you make a couple of track gauges you can the spike the track in the sections between them.



Another handy type of track gauge is the one shown below. I made mine from 1.6mm thick brass drilled and tapped to accept four 2mm diameter brass pins. The 2mm is equal to the check rail clearance for coarse gauge O standards that I use. With three or four of these you can set a curve and hold it while you spike.

Production of uniform large radius curves can be a problem if you use a length of string as you cannot always mark the centre point. By using a bit of simple trigonometry you can calculate an offset to a chord for a given curve length and radius. Here is a set of tables for a 600mm chord distance for various radii. The chord is the straight line between two points on a curve and the offset is taken midway and at right angles to it.

RADIUS	OFFSET
1.5	31mm
2.0	23mm
2.5	18mm
3.0	16mm
3.5	13mm
4.0	12mm
4.5	10mm
5.0	9mm
5.5	8.5mm
6.0	8mm

Gardening tips

After nearly two years of gardening I have been able to sort out those plants that are suitable and those that need replacing. I had planted pennyroyal as a ground cover and found the it grew up instead of out so I gave it a severe cut back. I also removed some Pratia that had started to smother other ground covers. This was the white flowered variety, the blue flowering one isn't such a vigorous grower. I have now planted it where it won't cause as much trouble.

Concrete landscapes

In building my railway I had wanted to create a landscape in a similar fashion to what I used in my HO modelling days. Paper towels and plaster of Paris was out so the next solution was to substitute sand and cement mix for the plaster and bird wire for the paper towels. The idea is to set up the proposed landform with the wire, preferably a couple of layers, and then wearing rubberised work gloves, force the cement mix through the wire mesh. I finished up with a thickness of about 25mm.

I played around with oxides as a base colouring and found that yellow oxide gives the best base.

As with HO railway practice I will use aluminium foil to create rock faces using sand and cement instead of plaster. I should be then able to apply acrylic house paint to then paint the rock face. If the paint weathers, all the better. I had heard that you can encourage the growth of lichen and moss by painting on milk or yoghurt onto rocks but I don't know if this would work on concrete because of its high lime content. Applying HO concepts to landscape creation in garden railways will allow you to make your railway more realistic. You will also be able to make deep cuttings that do not collapse onto you railway when it rains. The cutting can be used to break up the views of your railway creating separate scenes through which the train passes. These views will be even better when combined with scale sized trees and changes in elevation within the scene.

The Kundle Light Railway

by Paul Trevaskis

This line started as a circle of track laid in the bush near Cundletown. The track was welded up from wrought iron looking 6 mm steel strap. Laid straight on the ground it seemed like a good idea at the time. The line lasted for about three months before succumbing to damage from cats, possums, dogs, kids and my own boots when stopping hot engines. It was also prone to warping from expansion when the sun was high. The lines only locomotive was a single cylinder oscillator geared down 13 to 1. It was more of a railcar really and does still exist minus its body.

After having to move house the whole cheap garden rail concept was reconsidered with the finding of a heap of ½" by ¼" copper strap destined for the scrap merchants. Through the winter this was drilled and nailed or screwed to wooded sleepers and laid as an end to end line. Getting a smooth curve was almost impossible as the copper was so hard. I was soon sick of end to end running and when summer arrived the whole thing warped when the sun found the backyard. Yet another house move, this time to our own block, saw the line finally develop into a full loop and built from real brass rail. Once again the line started as an end to end. I was given some of the old brass window track, these I nailed to some hard wood propped up on some bricks. Once some small shrubs were established the effect was quite pleasing. With the purchase of some rail from Extruded Metals, the next step was to install loops at either end to give a continuous run of about 45 meters. The loop on one end sat on a concrete viaduct about 150 mm high and poured in situ. Big aggregate in the form of broken bricks were placed in the bottom of the formwork to lessen the amount of concrete mixed as it was all done by hand. This worked very well being cat and kid proof. Landscaping rocks and small plants finished that end off. The other loop was laid in gravel and tamped down level. By the time the plants became established the total effect was amazing. Then weeds found their way into the ballast. This meant a lot of time spent on maintenance. Then one day I sprayed the weeds and everything with Roundup. That killed the lot. By that time I was sick of the bird in the sky view of things. The whole lot was ripped out and rebuilt about 500m of the ground.

I used precast concrete forms for curves. These were packed up on bricks to the required height. The spaces filled in with shrubs or rock walls. The straights being on thick planks were simply raised up a bit more.

Having the track up higher made for much easier running and viewing. When sitting down on the grass with a glass one could, if I dare quote Tom Cooper, "watch the trains go by". Various methods of track construction were tried and found wanting. For sleepers I started with parquetry tile timber cut in half, being hard wood these last for yonks but needed drilling for track spikes. Some meranti was ripped and cut to size and soaked in sump oil.

These would last for a fair while but take some work to organise. A trip to the local lattice works came up with the lengths of the square edged treated pine they use. A length of this ripped length ways will give sleepers 12 mm by 8 mm and any length you wanted Being pine its easy to nail etc. and will not rot. Over the years this treated pine has proved to be the easiest to work with, quite cheap and there is no maintenance required. Just use a dust mask when cutting as the dust is poisonous.

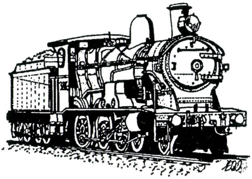
There were no suitable track spikes available at the time. To fix the rail I tried using brass escutcheon pins but they did not hold at all. Little screws proved too fiddly. Plastic chairs from Tenmille for their flat bottom rail have worked quite well. Each sleeper had to be predrilled to take the chair spigot . This must be accurate to maintain the gauge. I used a fence to set up on my drill press and drilled one end of each sleeper then moved the fence over 32mm and did it all again. All 500 of them. When completed this line was simply wonderful.

Then one Friday the whole lot was ripped up and laid on the stage of the Taree Police Boys Club for the Taree Model Railway Show. The reputation of this show was enhanced with the running of live steam for the first time in decades. Gordon Watson came up and with his Forney and with my Fairlie, we ran trains for three full days. We barely had a chance to talk to each other such was the interest shown. With another change of job and still another house move the line was never really reopened except as a test track. all the permanent way has been moved 500km north and the surveyors are out and about.

Thanks to the ***Rails in the Garden*** *group for the information in this section.*

A Record-breaking C32 class?

by Bernie Freeman



Sketch by Ernest Winter

When a schoolboy I lived in the country and was privileged to belong to the "Railway Family" as my father was the Per-way Inspector on the Mudgee line (western New South Wales) — this entitled my younger brother, Cedric, and I to certain "rights" not available to lesser children. We attended the small village school at Excelsior and lived about two miles further west at Weenga.

It so happened that school came out shortly before the Mudgee Passenger Train was due to arrive at the local station where the train had to stop to change the staff. We were both well known to all the train crews and were permitted to travel home in the cab of the locomotive. This was back in 1939. During the short trip it was my job to shovel the coal into the firebox — I must admit that I probably spilt more on the floor than reached the fire but I thought that I was doing a great job. I believe that I was an expert shoveller by the age of fourteen.

I vividly recall the day when the first green C32 (P) class locomotive arrived for our journey home. The driver helped me up into the cab making this one of the most memorable days of my life. I thought that this was the most beautiful engine that I had ever seen, painted green with red lining and polished brasswork everywhere. My brother agreed and when it came time to hop off near our home neither of us were inclined to do so.

Our father retired from the Railways in 1941 and the family moved to Sydney, unfortunately this was the end of our loco rides. I overcame this problem when I was sixteen by joining the New South Wales Government Railways. Until my retirement in 1989 my duties included Shunter, Guard. Instructor and Relieving Station Master.

I can remember a new P class frame fitted with smokebox, wheels, running gear etc., coming from the Clyde Engineering Works in 1954 — altogether there were only five of these frames made. From memory they were numbers 3387. 3388, 3389, 3390 and 3391. This embryo locomotive was taken to Eveleigh Workshops to have its boiler fitted. It emerged two months later, in all its glory, as 3391.

I was the guard on the train pulled by this loco some weeks later working the 5.13pm return from Richmond to Clyde Yards hauling an end-loading set with an LFX (dog-box) as extra car, nine cars in all totalling 228 tons. This train was all stations to Blacktown thence Parramatta and empty cars to Clyde Sidings scheduled to arrive at 6.27pm. After turning the loco around at Richmond in preparation for our return run I said to our driver, Les, "Les, I have been told that Dick holds the record for a P class from Blacktown to Parramatta non-stop in 10½ minutes. Do you think that you can better that?" A sly smile came over his face as he replied "With an engine having tyres like this one I am sure we can better that time — just leave it to me!"

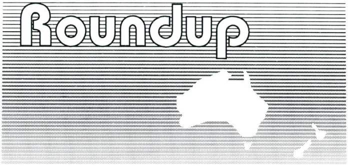
I have never seen a train get up to speed as quickly as that one as we departed Blacktown. Quite a number of Air Force personnel used to travel on this particular train en-route to the City and on this occasion I heard one fellow say to his mates "This driver must be full — I hope he will be able to stop at Parramatta when we get there." He need not have worried as we make a perfect stop, even though some may claim that it was a bit sudden after taking only 8½ minutes to travel the distance. Les came up to me, grinning from ear to ear "How did I go Bernie — have you ever had a better ride than that one?" I replied "Your 8½ minutes certainly cut a full two minutes off Dick's so-called record but I don't know if the commissioner would agree!"

Les confided "The loco was flat out and it was impossible to go any faster. I didn't shut off from Blacktown till stopping here, it was on the pilot valve on the down-hill run through Wentworthville." The fireman was a new-chum, not long out from England, his face was as white as a ghost and he had coal all over the cab floor.

This was the fastest ride I have ever experienced on a P Class and I am confident that this record still stands today even though official records cannot verify this. Les was the best engineman I have ever known but in those days they were all top operators.

In my opinion the P Class locomotive was the best engine ever used on the NSWGR's lines.

Club Roundup



compiled by David Proctor

Bankstown NSW

Bankstown Steam Locomotive Society members have recently held their AGM which saw a few changes to the make up of the Board. The new President is Neil Matherson and Dick Young is Secretary.

The track is now nearly completed and repaired after the vandal attack over the Christmas break. It is hoped, over the next few weeks, to fine tune the track and return to full operation. A great deal of landscaping is taking place and over 100 tonnes of donated fill have been used for the purpose. It is hoped to get another 100 tonnes from the excavation work currently being carried out in the construction of the tunnels and station for the new railway from the city to the airport at Mascot.

Bankstown Steam Locomotive Society

Location: Ruse Park, Hoskins Avenue, Bankstown

Public Running: 2nd Saturday

Upper Hutt NZ

Work is proceeding with the fabrication of the track for the 7¼" ground level railway, with about 43 metres already built, comprising both straight and curved sections. Work has also commenced on the laying out and welding up of the points for the passing loop at the station. The club has decided to service to good working order one petrol engined club loco and store the other for the time being. The battery electric club loco is also being done up and will be held at the station as an instantly ready standby.

At the Annual General Meeting in May, Richard Hatfield was re-elected President and Bob Begbie won another stint as Secretary. Committee meetings are to be separated from the Club meetings to improve the efficiency of running the club. A recent informal Open Day saw a good turnout of members, some visitors from a neighbouring club and perfect weather.

Maidstone Model Engineering Society Inc.

Location: Maidstone Park, Upper Hutt

Public Running: unknown

Warner Qld

How many clubs have entertainment provided by a genuine street organ? QSMEE member Warren Starr recently appeared with his newly acquired organ to give the members a treat. The organ was built about 10 years ago by J.Verbeeck in Belgium (still in production). It has 36 keys and 58 pipes. The hand winder operates two opposed bellows which provide a constant flow of air to a pressure reservoir which has a relief valve to minimise the effect on note sounds from variations in winding speed. Music is fed through in the form of folded cardboard books perforated with many holes which are detected by 'fingers' in the organ. The books are fed through by the winding of the handle. The sound of this music wafting through the gum trees made an interesting accompaniment to the sounds of the locomotives.

The magnificent (to quote members) toilet block is now in use and according to the club newsletter "If you haven't visited Warner lately, its time to make a pilgrimage to see and try the new structure." *(Now, there's a different excuse for an outing!...ed)*

Of interest to visitors, the bumpy, potholed access track has been replaced by a set of concrete car tracks, and computer operation of signals and points is soon to be available in the signal box. In the interests of tidiness and to reduce to incidence of spot fires, the club now has a petrol driven, wagon mounted blower for clearing leaves away from the track, courtesy of Jim Jackson.

At the 1997 Annual General Meeting, Don Bell was elected President and Bob Campbell continues as Secretary.

Queensland Society of Model & Experimental Engineers Inc

Location: Lot 5, Warner Road, Warner

Public Running: None

Auckland NZ

The annual Easter Open Weekend was a huge success! Visitors came from many clubs around the North Island and with the locals provided over 110 items for exhibition. There were some 32 locomotives, 6 aero engines, 18 tool entries, 18 stationary engines, 4 artillery pieces, 7 traction engines and at least 18 marine models and various miscellaneous items. A highlight of the weekend was a trip on the *Victoria*, a steam launch owned and built by one of the club members.

The marine models came mainly from the Scale Marine Modellers Inc who share the facility with ASME. The lineup included old style steamers like *Puke*, sailing ships, dinghies, a cargo ship and even a Jetski. The theme for Easter 1998 will be "Development of Industrial Power", where many unusual models are expected to be seen.

The club's electric loco has been fitted with an automatic headlight which comes on when entering the tunnel and goes out upon exiting. It gives a strong light and to date has proved very reliable. *(Maybe someone could write an article for AME?... ed)*

Auckland Society of Model Engineers Inc and Scale Marine Modellers Inc

Location: Peterson Road Reserve, Waipuna Road, Panmure

Public Running: every Sunday

Fairfield West NSW

WDLS members extended an invitation to members of the Bankstown club to use their club track whilst the Bankstown track was being repaired. Several visits have taken place with a variety of members and locomotives to the extent that the Fairfield folk were in the minority. Enjoyed by all!

The Wednesday work group have refitted the points and storage tracks near the station, and now concrete trackbed is being laid from the level crossing to Bamboo Corner on the up line. The AGM saw all members reelected, a sure sign they are doing a good job!

Western Districts Live Steamers Co-op Ltd.

Location: Fairfield Showground, Smithfield Road, Fairfield West

Public Running: every Saturday & 3rd Sunday

Manukau (Auckland) NZ

The MLS club recently received a visit from an OSH inspector. He stayed for several hours observing everything from opening up, lighting locos and passenger movements and rode behind all locos to check on cinder emission. He went away happy that overall the operation was being run in a safe and responsible manner.

Members are a lot more knowledgeable now about first aid. One of the club meetings was replaced with a First Aid talk given by a person with over 25 years experience as an ambulance officer. He covered CPR, as well

Club Roundup contributions

AME is pleased to receive club newsletters for consideration in this section. Newsletters are often a good source of articles, which we appreciate all the more, but most of all they help us keep in touch.

It is often difficult to decide what to publish and what to leave out. and the task of selecting material for a wider audience takes a lot of time. Also, there is always the risk that AME will publish something that the club considers sensitive. Please help by sending a "press release" page with your newsletter, or highlight the items you think we could use. We'll give first preference to clubs that help us out this way.

bmc

as tips on choking, burns and washing out eyes with a simple eye wash fountain.

The banks out of the tunnel have now been planted with ivy, and a 110mm dia. drain pipe has been laid to reduce the flooding on the uphill track.

Manukau Live Steamers Inc

Location: Mangere Centre Park, Robertson Road, Mangere

Public Running: every Sunday

Eltham Vic

Tenders have been called for the construction and supply of two new diesel outline locomotives. They are a NSW 81 class in Bicentennial livery (diesel-hydraulic) and an Australian National CLP (petrol-electric).

The trackwork just goes on and on! Work is proceeding on the construction of the new up line between Meadmore Junction and Diamond Valley. The 68th set of points is ready for installation and work has begun on the 69th set. For the future, a new station platform is to be constructed at Diamond Valley with a new pedestrian footbridge to provide access. Approval has been received for the track duplication between Meadmore Junction and Diamond Valley, including two new bridges.

DVR is now on the Internet at http://www.nmit.vic.edu.au/~DVR/index.html

Diamond Valley Railway Inc

Location: Eltham Lower Park, Main Road, Eltham

Public Running: every Sunday

Durban South Africa

In line with the way the hobby is moving in South Africa, DSME have appointed a Safety Officer to oversee the whole operation. They still regard themselves lucky compared to some of the requirements to be met in other countries.

The first pair of the new MK3 bogies has been completed and the first of four body shells have been moulded for the new passenger trolleys. Work has also started on the flexible traverser. The track has been realigned to provide for the smooth transition of trains. 32mm dia, pneumatic cylinders with microswitch position indicators have been fitted to the locking bolts and the facility for manual operation has been retained.

Work continues on the 7¼" gauge *Highwayman* by some members. The impression may have been given previously in this column that this is a club project. This is not the case, as the loco is an independent project where some of the participants are DSME members. The DSME operates only on 3½" and 5" gauges.

Durban Society of Model Engineers

Location: Kellaway Hall, Hinton Grove, Virginia,

Public Running: 2nd Sunday

Wilson WA

The application made by Castledare members for a grant to rehabilitate the area inside the Wilson oval in front of Wilson platform has been successful. That was the easy part! Members now have six months to complete the project which primarily involves the planting of over 2000 trees and shrubs. The idea is that what is currently a barren wasteland will be a scenic area where the railway passes through a continuous grove of paperbark trees, which also provides shade and a windbreak. Convention goers will appreciate it!

There has long been some conjecture as to the length of the track. A rough measurement shows the Home circuit to be 1.5 km and the Wilson circuit to be 1.64 km. Ongoing preparations continue for the 1998 Convention, but before then the members have their annual run day for Princess Margaret Hospital on 21 September.

Castledare Miniature Railways of WA Inc

Location: rear of 100 Fern Road, Wilson

Public Running: 1st Sunday

San Francisco USA

The Spring Meet was a great success with almost 500 guests for the two days and plenty of locos running. The stationary boiler powered several static displays

16 metres of new steel rail has been laid on the ground level with further sections made up ready to install. The old buildings from Millers Outpost are being refurbished.

Golden Gate Live Steamers Inc

Location: Tilden Park, Loma Cantadas & Grizzly Peak Blvd, Berkley

Public Running: unknown

Invercargill NZ

The decision has been made to go ahead with the construction of a station building, which will be a 3.6m x 3.6m roof over one track and a ticket office. There will be a concrete platform and anti tip rails for loading and unloading passengers.

At a meeting celebrating the Society's 60th anniversary, the minutes of the original 1937 meeting were read, followed by the cutting of a birthday cake and some reminiscing. Occasionally meetings were held at the Borstal (now the Invercargill Prison) where a member was a warder.

The AGM was held in May and Warren Jones was elected President. Peter stark is still the Secretary.

Southland Society of Model Engineers Inc

Location: Surrey Park, Invercargill

Public Running: unknown

Evandale Tas

Home of Railex '97 which will be on Friday 7 November to Sunday 9 November An extra day this year! Times for each day: Friday 11am - 9 pm, Saturday 9am - 6pm, Sunday 9am - 3pm.

Live steam, diesel, petrol and electric locomotives in 3½", 5" and 7¼" operating on our established track system behind Falls Park which is where all the displays will be found. Rides will be available (first ride at no extra cost) on 7¼" track only.

The railway is situated at Evandale, 15km South of Launceston, Tasmania. Go out past the Launceston Airport to Evandale and follow the signs.

Public running days are each Sunday starting about 9.30 a.m. — weather permitting. Cost is $1.00 per ride. Visitors from other clubs and their families are welcome to ride free if they introduce themselves. Club day and working bee is the second Saturday of each month.

The track is entered through the Evandale Market also known as Falls Park. There is a 7¼" and 5" dual gauge ground level track of about 400 metres and a 5" and 3½" raised track of about 110 metres. A carriage and loco shed have just been completed. We have begun plans to add a further 400 metres of extensions to the 7¼" track. Both tracks have raised steaming bays with 240 volts and water available. Adjustable loading ramps allow easy access for locomotives. The ground level track also has a turn-table available.

If you are on the internet see our homepage at: http://www.vision.net.au/~elrss/

You will find images the member's locos and the latest news about Railex 97.

Evandale Light Railway and Steam Society

Location: Evandale, rear of Falls Park

Public Running: Every Sunday

Toowoomba Qld

Toowoomba Live Steamers Inc. have a new home! They have signed a lease with Toowoomba City Council for use of Kearney Springs Historical Park, Spring St. Toowoomba. Our club operated a miniature railway, in the confines of Willow Springs Adventure Park, for 15 years before it was decided, by club members, that we needed a new home free from commercial ties.

Toowoomba City Council and our club have had ongoing negotiations over the last two years, culminating in a successful agreement to conduct our operations in the beautiful natural setting of a public park.

The track will be of dual gauge construction (7¼" and 5") built to the same standard to that of Willow Springs and therefore capable of catering to the needs of the heaviest locomotives. However, with a maximum grade of 1:80, and a minimum radius of 50m all locomotive type, are provided for.

Toowoomba City Council has so far spent in excess of $30,000 in survey, design and earthwork construction. This club is most grateful for the co-operation and financial assistance given to us.

Since December 1996, working bees have progressively, constructed the 40m x 40m compound, set the turntable in position, and refurbished 300m of the old track. New sleepers have been made, crusher dust purchased, so we are now ready to start laying track.

Tamworth NSW

Tamworth and District Model Engineers officially became an incorporated body on 26/3/97. We are an enthusiastic group who are on the lookout for others who share our interest in the whole spectrum of model engineering. Our members have a wide range of interests including stationary models, locomotives, clocks and boats.

Some of the members are interested in the construction of a track and to date considerable progress has been made in securing the support of Tamworth City Council who are joint partners in wishing to see a track built in one of its parks. At a public meeting held to gauge the reaction of the local residents, the message we were given was that they were overwhelmingly in favour of the proposal. Plans have been drawn up by President, John Buckley, that divide the dream track into three manageable stages. Various sources of funding are currently being pursued to allow that first stage of construction to commence.

The members meet regularly on the second Saturday of the month and details of the next meeting can be obtained by ringing the secretary, Geoffrey Young, on (02) 6766 7379. New members will be most welcome!

Leeton NSW

A new Model Railway club (model engineering) has been formed at Leeton. The track will be at the Yanco Power House Museum (5km from Leeton). There is 500m of 5"g and 7¼"g track ready to lay with material for another 500m on order. We hope to officially open the track at the Easter Rice Festival in 1998. Earth works for the track have started. Anyone in the Leeton area who may be interested can contact Steve Lewis (02) 6953 3953 or Ivan Evans (02) 6953 2097.

St Marys NSW

Track upgrading work at the Sydney Society of Model Engineers is continuing with about 90% of the wooden sleepers replaced with steel sleepers. Some sections have been re-ballasted with heavier ballast to permit the smoother passage of trains regardless of locomotive size.

The Signals and Communication Branch (Dennis Gilmore and Gordon Twiner) are installing a new signal system. The new system electrically isolates the throwover turnouts once a train has passed the signal protecting the turnout. Power is restored to the turnout once the train has passed a clearance location further through the section. To provide additional protection, the signals can't be cleared unless the turnouts are correctly aligned.

The Board of Directors decided to move the celebration of the Society's Anniversary to the weekend of 29th and 30th of November rather than October. The decision was made because of the increasing number of events held in October (other than railway). It is hoped that the weather might be kind to those who wish to camp on the site after enjoying a night run.

Sydney Society of Model Engineers
Location : Luddenham Rd. St Marys, NSW
Public Running: Last Sunday, except Dec.

Canberra ACT

Activity within the club includes an active clock making group, a marine steam interest group and a small but growing band of traction engine operators. There is also a strong rail following. Members have been busy installing a new block signalling system in readiness for the September Invitation Run. At the same time, members are busy in their home workshops putting the finishing touches to models and projects to display at this year's Malkara Model Railway Exhibition. in August. The highlight for this year will be the Canberra Invitation Run (see Coming Events for details).

Canberra Society of Model and Experimental Engineers
Location : Kingston ACT, Geijara Place.
Public Running: Last Sunday

Coming Events

6, 7 September
Central Coast NSW Birthday run

The Central Coast Steam Model Co-op Ltd invite all model engineers to their grounds at Lot 10 Showground Rd. Narara. Contact: (02) 4388 2416

27, 28 September
Canberra Invitation Run

Come to Canberra for steam and Flowers during Floriade 97! 2½" and 3½"g elevated. 5" and 7¼"g ground level. Contact: James Mitchell, PO Box 4462, Kingston, ACT, 2604.
Phone James Mitchell (02) 6286 5936 or John Nicolson (02) 6247 7182.

4, 5, 6 October
Port Augusta annual Steam up

The members of the Port Augusta Model Engineers Society invite all model engineers to their grounds for a long weekend steam up. 5"g track only.
Contact: Ern Riding (08) 8642 3858

3, 4, 5, 6 October
9th National Miniature Traction Engine Rally at Walka Water Works

Maitland NSW is the place to be this October Labor day weekend.
Contact: Bob Neal (02) 4932 8507 or Peter Smith (02) 4975 4548

11 October
AALS (Vic. branch) Interclub run SLSV Moorabbin

All welcome. Running from 9am to 5pm or possibly a night run. Meals provided as required.
Contact: Graeme Tinkler (03) 9798 5202.

10, 11, 12 October
Hornsby Model Engineers Annual Birthday celebrations

AALS and AMBSC codes apply.
Contact: Ted Gray (02) 9484 7583

11, 12 October
7¼ inch rail/traction engine weekend, Berry, NSW South Coast

Picturesque Berry Railway has 2 km of 7¼ inch gauge track, and meandering pathways for traction engines. Inquiries: Les Boyd on (02) 4464 1304.

18, 19 October
South West Model Engineers 2nd Invitation Run at Cobden Vic

Come and enjoy the Cobden Hospitality once more with the South Western Model Engineers at Cobden Railway Park. The invitation run is in conjunction with the Cobden Spring Festival. 3½", 5" and 7¼" gauges. Contact John Wiggins (03) 5595 1430 for further information.

25 to 27 October 1997
New Plymouth Soc. of Model & Experimental Engineers

Annual Open Weekend

1, 2 November
Wagga Wagga Invitation Run

5" and 7¼"g track in scenic surrounds. Model traction engine track, Boats on the Wollundry Lagoon. HO gauge model railway.
Contact: David Font (02) 6921 4762

7 to 9 November
RAILEX 97, Tasmania

Evandale Light Railway and Steam Society invites all interested to visit their grounds for a fun weekend of railways.

29, 30 November
SSME Anniversary Weekend

Join in the fun at Luddenham Rd. St Marys NSW. On-site camping available.

8 to 12 January 1998
International Model Engineering Expo, Tauranga NZ

Model exhibition, hobby displays, working demos, road vehicles, railways 2½", 3½", 5" and 7¼" gauges.
Registration forms now available from: **Expo 98** Secretary, 326A Devonport Road, Tauranga NZ

10 to 13 April 1998
AALS Convention

Castledare Miniature Railway, Wilson, WA. Contact the club on (08) 9356 2290

10 to 13 April 1998
South African National Steam Meet

Hosted by Durban Society of Model Engineers, Virginia, Republic of South Africa.

3 to 6 September 1998
Major Centenary Exhibition

The Society of Model and Experimental Engineers (UK) 1898 - 1998. At Brunel University, Uxbridge, West London, England (see News Desk for details).

A Cheap Digital Readout for a Mill

by Peter Dawes

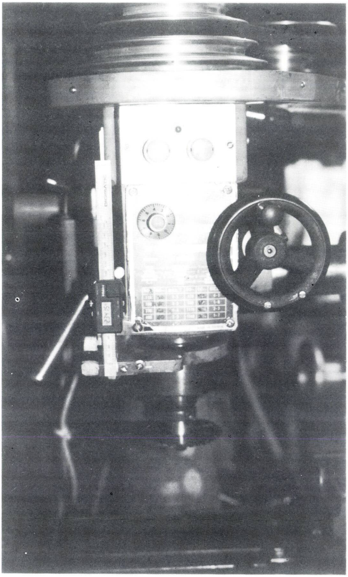
One of the biggest problems with the common Taiwanese mill/drill is vertical feed. The weight of the quill causes it to drop down against the backlash of the rack and pinion, making accurate vertical measurements extremely difficult. I solved it by using a digital caliper to make a scale. The fixed jaw is screwed to the clamp ring at the bottom of the quill. The moving jaw bolts to the body of the mill. The whole job can only take a couple of hours *but* the two things that decide how easy it is, are:

(1) being able to find suitable places to attach the caliper jaws, and

(2) drilling the holes in the hardened jaws.

Choice of digital caliper

It's most important to use the 150mm/6" Mitutoyo digital caliper (approx $180-$210) not the cheaper Chinese model, because the latter has auto turn-off after a few minutes, and that is most inconvenient. It will almost certainly have turned off by the time you want to take another reading and you have to move the jaw or push one of the buttons to turn it on again. If you push the RH button you set zero. While I have one of these Chinese calipers and find it quite a good instrument in ordinary work, comparable in fact to the Mitutoyo, it is not suitable for this application.



The digital vernier mounted on the mill.

The advantages

- Backlash is now irrelevant.
- The readout is digital. In fact the non-digital vernier won't work here because of the difficulty in reading the fine scale turned on its side.
- Measurements are repeatable to 0.01 mm or half a thou.
- Accuracy is 0.02 mm or one thou.
- Metric or inches is selectable at the press of a button,
- A reading can be locked electrically at the press of a button.
- Zero can be set at any point, again at the press of a button. This means I no longer have to do arithmetic in my head.

For this idea to work there must be something around the body of the quill at the bottom to which the fixed jaw of the caliper can be bolted and which will allow the caliper to stand vertically on the left side of the mill without fouling anything. This will probably be the bracket that holds the calibrated depth rod. Remove the rod if necessary because its only function now will be to act as a mechanical depth stop and it doesn't do that reliably anyway.

See photo. Note that those push-buttons at the top of the front of the mill and the calibrated knob below, are controls for a variable frequency dial-up speed control.

The 150mm (6") range of the caliper is more than enough to span the full vertical feed range. It doesn't matter if the caliper zero doesn't correspond to zero on the quill. You'll have plenty of spare length and you just set zero wherever you want it.

For example, suppose we want to mill a keyway in a shaft with a slitting saw. Lower the bottom surface of the saw blade flush on the top of the shaft. Some people use tissue paper to do this, lowering the quill until it grabs the paper. Select inches on the digital readout. Set the scale to zero. Move the tool away from the shaft and lower it by half the diameter of the shaft plus half the thickness of the saw, using the digital readout. Lock the quill, feed the tool in 1/16" or as required, and start cutting. It's that easy. Forget about metric dials and cryptic scales, forget about backlash.

Note that the depth gauge rod of the caliper remains at a fixed height extending out of the body of the caliper when the quill is at the bottom of its travel. The depth rod plays no part here.

The display of the caliper will be turned 90 but being digital is easy to read.

Drilling holes in the jaws

This requires a carbide drill suitable for hardened steel. About 4 or 5mm diameter is okay — whatever suits the screws.

The drills I used (Artu All-round Bohrer, came in a set of seven from 4 to 12mm, from Germany, via Perma-Seal of Heidelberg Vic), and were obtained at the Orange (NSW) National Field Days. But there are certain to be others available. They should be run relatively fast (2000 revs/min), *not* slow as normal drills would be run in hard steel.

Run them dry with a lot of pressure. Just make sure you don't heat up the works of the caliper or damage it. Don't jar it and don't try to centre-punch it because it's too hard. To start the drill grind a tiny indentation with a sharp pointed grinding wheel such as a Dremel®. Take special take care not to scratch the plastic scale along the shaft of the caliper. Allow the heat from the first hole to dissipate before drilling the next one.

Drill two holes in the fixed jaw about 10-12mm apart or as required to suit the place where it is to be attached. Drill one hole in the moving jaw to suit the place where that will bolt on. You could in fact get away with one hole in each jaw as long as the alignment is okay. Alignment is all-important. Position the caliper where you want to attach it and spot the holes in the mill body.

Continued on page 48...

Warringah Model Engineers

Story and photos by Brian Carter

I had the pleasure of attending a meeting of the Warringah Model Engineers to celebrate their first birthday. The members decided to celebrate in style by holding a stationary engine modelling contest.

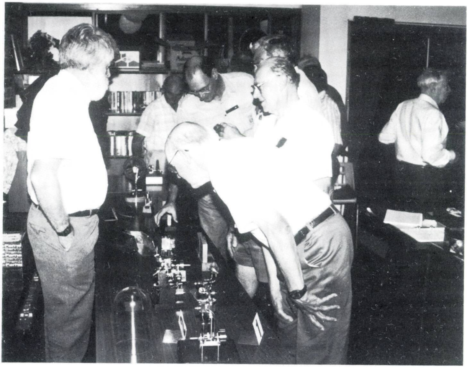
The contest

The contest was announced several months in advance to give the members time to create their masterpieces. No less than 10 models were presented for judging — a most daunting task!

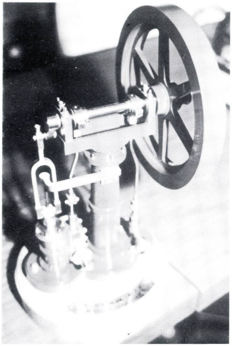
To liven things up, the models were numbered so that the owners couldn't be identified until after the event. Not a bad idea — at least it saves the judge from being accused of favouritism!

Meet the models

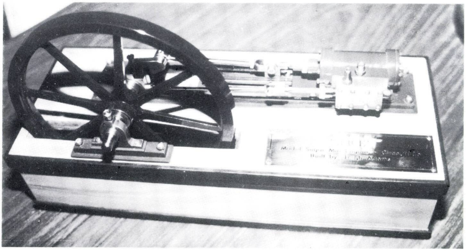
- **1**. A first attempt by Warren Reaney who fabricated a 5/8" x 5/8" vertical engine. The engine is displayed under a glass bell jar. An interesting side to this project was its origin. The model was design sketches were produced in the van on the way back to Sydney from the Model Engineering Exhibition held at Monash University.
- **2**. Bob Short decided to try something different — a 3/4" x 3/4" single cylinder engine with a twin screw output! Bob utilized a Bosch cordless drill gearbox in the final drive. The engine has a crank case and gear driven pump.
- **3**. A fully fabricated Benson engine. Leigh Adams constructed this beautiful model in about two weeks! It runs as well as it looks on the front cover of this issue. An interesting feature is the flywheel — it was made in three sections and Loctited® together.
- **4**. Ron Adams presented an engine of about 3/4" x 3/4" bore and stroke. The fabricated engine featured a gear driven feed pump.
- **5**. A single Cylinder 5/8" x 5/8" vertical engine. Scratch built from brass and steel by Ray Adams. This engine was Ray's first attempt at steam engines. The engine ran well on compressed air.
- **6**. Bob Short presented another engine — again a little more unusual than most. It was a single cylinder oscillator with dual ends! The pipe work contains a reversing valve that works very well. It must have been tricky lining up the valve timing and having a crank at each end.
- **7**. Another Ron Adams creation. This one has a semi rotary valve gear that operates a bit like a Corliss valve. It worked very well despite its small size.
- **8**. Leigh Adams presented another model based on AME's *Alice*. The horizontal mill engine construction series that featured in issues 45 to 50. The elegant lines of the model made it a joy to watch in



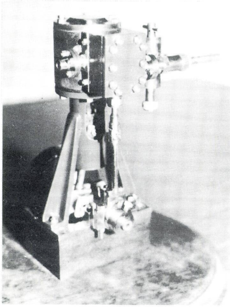
Some members of the Warringah Model Engineers admiring the collection of models.



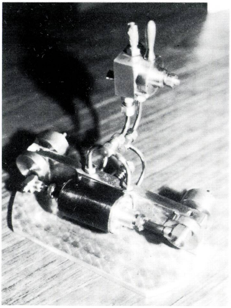
First Prize — engine 3.



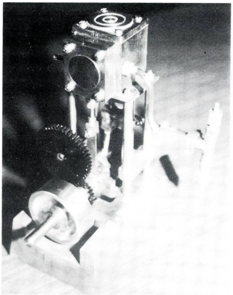
Second prize — Engine 8.



Third prize —Engine 5.



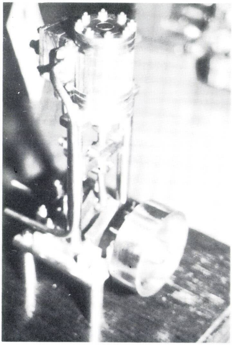
Engine 6.



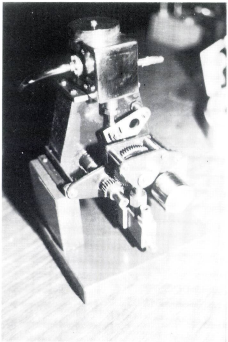
Engine 4.

operation. Leigh ended up making two flywheels. The first was fully fabricated in three parts and silver soldered together. The end result was a useless flywheel due to the distortion from the heat application. The second flywheel was made in mush the same way but heat was avoided by Loctiting the parts together. This valuable lesson was used on the Benson engine.

- **9**. This Leigh Adams built engine was motivated by the Dave Sampson collection that appears in *Steam Chest* from time to time. Dave Harper photograph's the Sampson engines with a matchbox next to tham for size comparison. Leigh decided to use a matchbox as a size gauge for this project.
  The engine has a ¼" bore and ⅜" stroke, and is fitted with a slide valve. Valve timing is tricky on this one — there is no adjustment on the valve rod — the timing is achieved by adjusting the height of the left hand column. The right hand column flexes to accomodate the adjustment. The crankshaft comprises of nine parts — all loctited together. In order to fit in the matchbox, the inlet tube had to pass through the cylinder wall to reach the steam chest.
- **10**. The final engine in the queue was also a single cylinder unit, but fitted with a piston valve. Another engine from the Leigh Adams stable, this one was designed around a twin cylinder flash steam engine. An unusual feature of this engine is the exhaust port on the cylinder wall.



Engine 1.



Engine 2.

The Warringah Model Engineers

by Leigh Adams

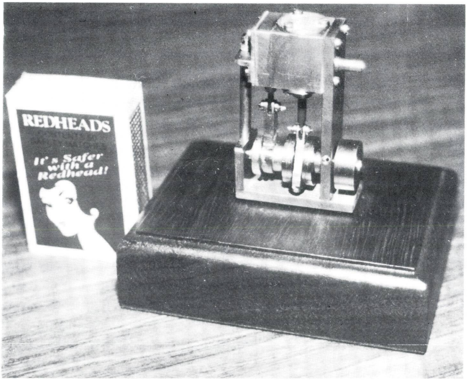
Warringah Model Engineers was formed in January 1996 to provide a club for people who are involved, or with an interest in, all kinds of model engineering. Historical, experimental and whimsical models in all sorts of materials are encouraged. In the first year the membership has grown to 24 with an active programme of meetings and visits.

Meetings are held on the second Thursday each month at Eurobodalla Homes Hall, Aquatic Drive, Allambie Heights, starting at 7.30 pm. A special presentation is made at each meeting and have included lathe demonstrations, measuring instruments, new models, historical restoration projects, experimental engineering and specialized tools. This is a great place to meet people with strong engineering backgrounds and pick up tips and solve most of those "how do I do that?" problems.

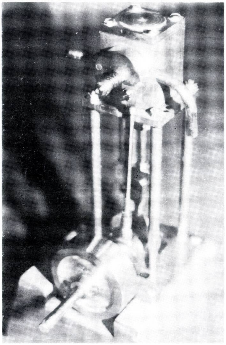
Visits have been arranged to see the building of the new Navy mine hunter under construction in Newcastle and a sale of specialised tools in Parramatta. Additionally a full social programme is a feature of the club activities.

The membership is drawn from a wide cross section of the community. New members and guests are always made to feel most welcome.

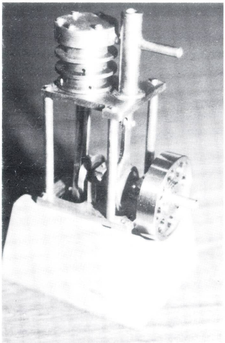
So if you are interested in innovative engineering be it from the development or historical perspective, come and explore the possibilities with others of like minds, turning those ideas and dreams into a miniature reality. We need members with all sorts of skills and backgrounds to build a happy and successful club.



Engine 9.



Engine 7.



Engine 10.

SAVE THE COAL

Steam discharged through the safety valve represents coal wastage. The discharge of steam in this manner for one minute entails a loss equivalent to 12lbs of coal which is sufficient to haul one ton a distance of 50 miles.... Eliminate this wastage by your personal thought and effort.

Reprinted from: *Handbook on the locomotive*, Victorian Railways 1951. *C.H.Wear collection*

A Cheap Digital Readout for a Mill

Continued from page 45...

The caliper must line up vertically in both planes. Drill and tap for suitable screws. You may have to pack the back of a caliper jaw or file the bolting face to line it up vertically in the fore and aft direction. The inside jaws have sharp points which can be dangerous. I pushed corks on them rather than grind them off, but I will almost certainly be leaving the caliper permanently on the mill so I will probably grind the points off eventually.

Changing the battery

The only minor hassle comes when the battery needs replacing (SR44 from Dick Smith and camera stores) because its compartment is inaccessible while the caliper is screwed to the mill. Even so, it's only necessary to release two or three screws.

A remote display

An additional improvement would be a remote display, but unfortunately these aren't being imported, and in any case are extremely expensive. The cable with the special miniature 5- pin plug that plugs into the caliper costs about $70 when tax and freight are added. Its other end fits a 2x5 double row computer socket with pins on 0.1" centres. 10 pin sockets are not available but can be made by cutting off part of a longer one. (Contact MTI Qualos P/L, 11 Punchbowl Rd Belfield, NSW for info on Mitutoyo accessories).

The 5 pins are respectively: ground, data, clock, data ready (inverted), and request to send (inverted).

The experienced electronics buff could in fact make a remote LED display because the device comes with (very brief) details of how the measurements are coded as electrical signals. The logic is similar to CMOS but only 7 volts, is open drain, with max loading of 400uA. Vdd is 1.5V. I don't understand whether the clock is internal or must be supplied from externally. Putting it on an oscilloscope should reveal all.

There are 13 BCD-coded digits of 4 bits each. These specify the sign, the units, the decimal point, and the five digits themselves. The remaining digits are not used. The signals at 1.5V would have to be level-shifted up to 5 or 10 V. The data is read serially, so it has to be "clocked" into something like a shift register, then it must be decoded from the BCD (binary coded decimal) into seven segments and finally buffered to drive the seven segment LEDs. It would take power from the mains, not from a battery.

A remote display would be nice, but making one is not for the inexperienced unless it was presented in a kit form. Perhaps somebody might be inspired to work up a circuit for one.

Even without this little extra luxury, it's turning out to be a great improvement. There's no way I'm ever going back to the old arrangement.

The McNab Bucket Rudder

by Dave Harper

Speed controllers for electric powered model boats are a constant source of hassles. For steam and IC powered models, the problems can be even greater. Variable pitch props have been tried, with varying degrees of success my own experience has been less than 100% satisfactory.

I recently came across a McNab rudder advertisement in a 1926 copy of *The Rudder* magazine in a library. The McNab Rudder steers and reverses without touching engine control! It looks to me very much like the Kitchen rudder used on many RN steam pinnaces of the same era, and the principle is used today to provide reverse thrust on jet airliners.

Kort type nozzle

It consists of a split nozzle which surrounds the prop. When turned, it steers like a Kort nozzle. However, when the halves of the bucket are closed the propwash is directed out and forward, giving reverse thrust.

Intermediate positions give slow ahead and neutral, so it does indeed give full control without touching the motor. Studying the pictures in the ad, it appears that the buckets should be about 50% bigger diameter than the prop. So, for a 50mm prop we need a 75mm bucket. It seems reasonable to me, so that's how I decided to design my version.

The design

The two halves of the bucket run in concentric bearings so they can turn together, or independently, as required. Developing the shape of the buckets was a bit of a puzzle, but among my collection of old engineering books gleaned from Lifeline book sales, I found one entitled *Geometry for Sheet Metal Workers* by Dickason, (Pitman 1956). This put me on the right track, and the method is shown in fig 1. A bit of fine tuning with a file may be needed to get the buckets to close neatly.

The drawing

The McNab rudder drawing shows a section through the pivot looking aft and shows the concentric bearings (top right). A skeg is usually built onto the hull to support the lower end of the buckets.

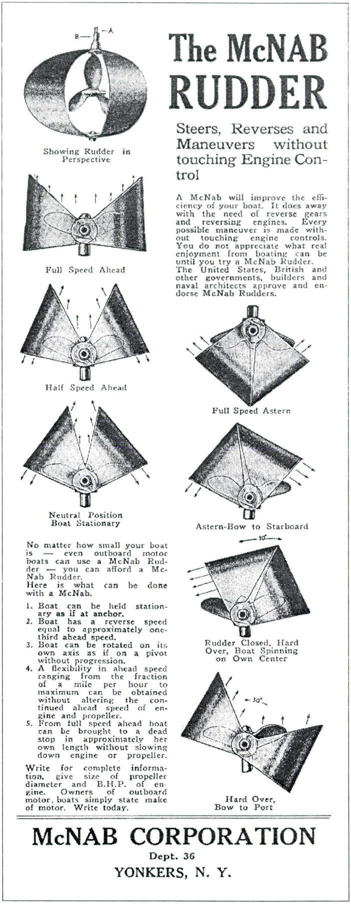
Centre left shows the simple brass tillers as I usually make them. The hub is turned from ⅜" brass bar and the arm from brass sheet. The two are silver soldered together and the hub is drilled and tapped M3 for a grubscrew.

The control linkage

The control linkage is also shown on the drawing. The servo mixer is a gadget purchased from the local hobby shop, it's used on model aircraft with V tails. It consists of a disc which mounts on the steering servo — pivoting on this is a bar with three arms, each topped with a ball joint coupling. The centre coupling is connected to the other, speed servo, and the outer ones connect to the bucket tillers. In operation, the steering servo operates the whole mixer unit, and the buckets turn together just like a Kort nozzle. When the speed servo operates, it pushes the mixer arms, and thus the tillers, backwards. This turns the buckets inwards, eventually closing them together. When this happens, the propwash is directed outwards and forward, giving reverse thrust. At some intermediate point, the net thrust will be zero, giving a neutral position. At this point I plan to have a micro switch operate to stop the motor, an obvious need for an electric model.

The ad

The pictures in the McNab ad show all the possible permutations of bucket positions and the resultant forces. I make no claim to originality for using this idea on a model, in fact I'm quite sure there will be some one out there using one already! If there is, please let me know, so we can compare notes and pass on any useful info to our readers!



The McNAB RUDDER

Steers, Reverses and Maneuvers without touching Engine Control

A McNab will improve the efficiency of your boat. It does away with the need of reverse gears and reversing engines. Every possible maneuver is made without touching engine controls. You do not appreciate what real enjoyment from boating can be until you try a McNab Rudder.
The United States, British and other governments, builders and naval architects approve and endorse McNab Rudders.

Showing Rudder in Perspective

Full Speed Ahead

Half Speed Ahead

Neutral Position
Boat Stationary

Full Speed Astern

Astern-Bow to Starboard

Rudder Closed, Hard Over, Boat Spinning on Own Center

Hard Over,
Bow to Port

No matter how small your boat is — even outboard motor boats can use a McNab Rudder — you can afford a McNab Rudder.
Here is what can be done with a McNab.

1. Boat can be held stationary **as if at anchor.**
2. Boat has a reverse speed equal to approximately one-third **ahead speed.**
3. Boat can be rotated on its own axis as if on a pivot without progression.
4. A flexibility in ahead speed ranging from the fraction of a mile per hour to maximum can be obtained without altering the continued ahead speed of engine and propeller.
5. From full speed ahead boat can be brought to a dead stop in approximately her own length without slowing down engine or propeller.

Write for complete information, give size of propeller diameter and B.H.P. of engine. Owners of outboard motor, boats simply state make of motor. Write today.

McNAB CORPORATION
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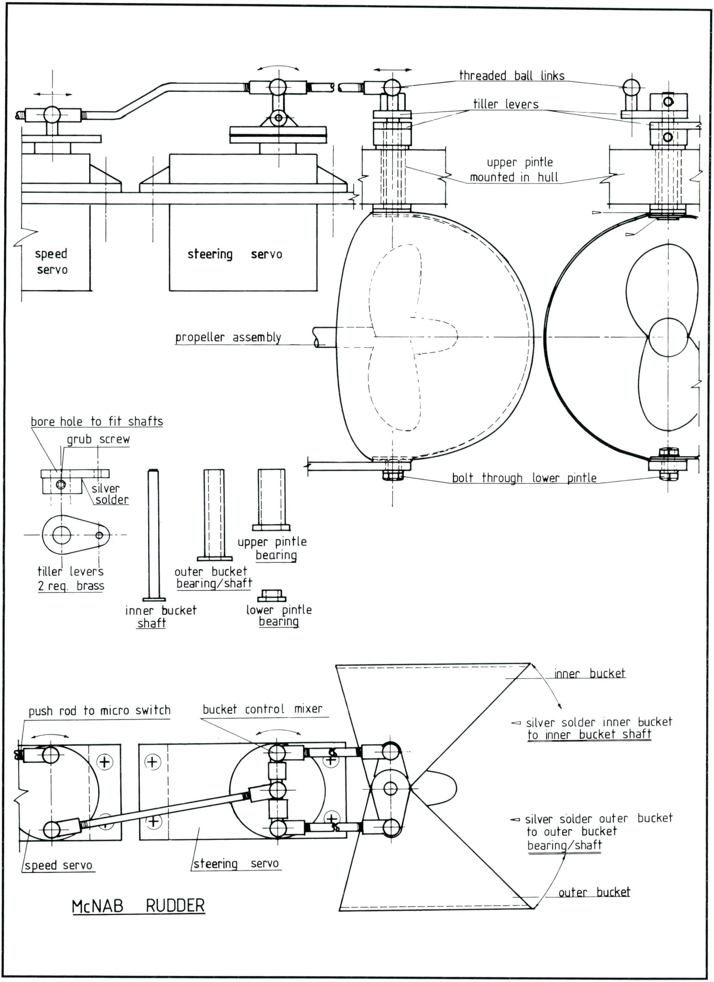
McNAB RUDDER

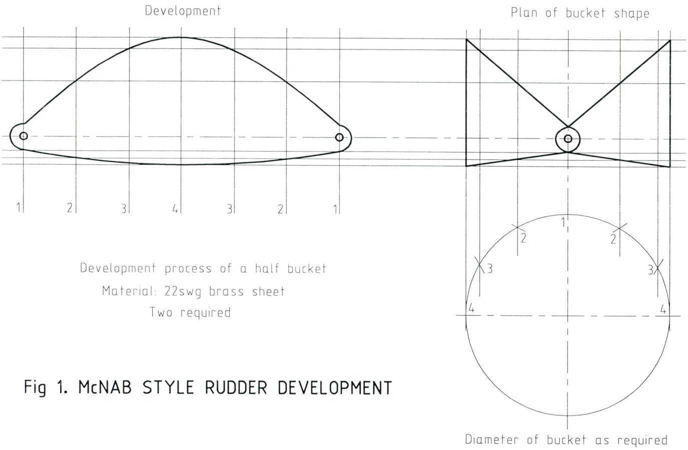
Development
Plan of bucket shape
1
2
3
4
3
2
1
1
2
2
3
3
4
4
Development process of a half bucket
Material: 22swg brass sheet
Two required
Diameter of bucket as required

Fig 1. McNAB STYLE RUDDER DEVELOPMENT

Australian Model Engineering

New Subscription Form

	Surface	Econ Air
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New Zealand		A$35
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AME September-October 1997

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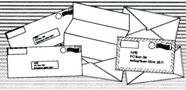

What's in a name?

Sir,

Congratulations on a "Bumper" July-August issue, especially the effort put into the convention report.

I would like bring to your notice however, one item in the report that may cause some misunderstanding. I refer to the paragraph *What's in a name?*

The recent changes to the structure of the Association (AALS) did not require a new name for the organization but the members decided that a name change for the new Standing Sub-Committee was required.

In 1996 it was agreed that AMBSC would become a Technical Sub-committee of AALS. At the same time another Technical Sub-Committee was set up to take care of safety, training and operational matters affecting Societies. This was given the title AMSTOC (Australian Miniature Safety, Training and Operational Committee. This name survived the rewriting of the Constitution but never really sat comfortably. This resulted in another name being put forward for adoption at the 1997 AGM but this was also rejected with the result being decided in favour of Australian Live Steamers Safety Committee ALSSC.

What we now have is *one* organization looking after the needs of the hobby, and *one* organization meeting with Statutory Authorities. This organization is the Australian Association of Live Steamers. It has departments looking after boiler/pressure vessel design, construction and testing, safety matters affecting societies, training requirements and operating standards plus the ever important section looking after Insurance.

I hope this clears up any possible misunderstanding readers, especially non-club members, may have.

Barry Glover
President AALS

Steam preservation

Sir,

I read with interest your editorial regarding the future of steam in this country.

I am a subscriber to AME and I am also the Assistant Secretary, Lachlan Valley Railway, Cowra.

At the Board Meeting of the LVR I read your editorial and was supported in writing to you and supporting your views.

As I have said LVR is situated at Cowra. We have a TF 5367 in steam, 30T 3026, having the axle boxes repaired, 3237 being restored, 5917 needing boiler repairs and a 30 class locomotive in the restoration stages. Along with these locomotives we have 1059, a steam crane, which I think would make a great model — if I only had time. The crane is running and I believe the only one left that is going.

LVR also has numerous carriages and other work vehicles, along with 42, 44, 47 class diesel locomotives. We also have sleeping carriages and if bookings are made by clubs we can rent them accommodation for weekends.

The Lachlan Valley Railway is a registered charity with its aims and objectives to the preservation of steam locomotives and rolling stock. Money is always tight and all the workers are voluntary and give their time freely. We have a good workshop, where I spend my time as a fitter.

If you or any clubs wish to contact LVR you can ring or fax (02) 63413599, or write to me, C/o Lachlan Valley Railway, PO Box 279, Cowra 2794.

Paul Vaughan
New South Wales

Corrosion proof tanks

Sir,

The use of plastic waterproof tanks in tenders (AME 73, page 40), is a good idea, and the Perspex® (poly-methylmethacrylate) tank liner described in the article will probably give satisfactory service if the Acrifix 192® glue is as good as described. However, after much experience with Perspex in the scientific field (for insect cages, water bath covers and hand-made apparatus), I would recommend an alternative plastic. Nowadays a great variety of plastics is available, but PVC (polyvinylchloride) would seem to me to be the material of choice for water vessels, and I strongly suspect that plumbers would advise similarly.

The disadvantages of glued Perspex are:

1. It distorts when in long-term contact with water or water vapour, particularly if the water is warm. The wet surface will swell relative to the dry surface and moulded corners and curves will tend to straighten out.

2. It is brittle and inflexible. Drilling and machine tooling of it can be hazardous and the lack of flexibility places stress on any glued joints. If the Acrifix 192 glue recommended in the article has Perspex as its solid component then joints will be brittle. Brittleness is perhaps not a good thing in a vehicle subjected to vibrations while moving, and which might be sat upon in some designs.

3. Perspex is fearfully expensive, even as offcuts. In contrast, the advantages of PVC are:

1. It is stable in contact with water, and is used extensively for fabricating one-off tanks in the plumbing industry.

2. It is strong, reasonably flexible and can be moulded under heat to give stable rounded corners, domes etc. Drilling, machining and hot-moulding are easily done and strong joins can be made by welding. However a hot-gas welder for plastic costs over $700, a purchase beyond the range of most individuals. Therefore initial fabrication of a tank is probably best done by a plastics fabricating company, of which there are many in all capital cities.

3. Sheet PVC is not as expensive as Perspex and, in addition, there is a variety of PVC piping and other plumbing components available. These, and a glue suitable for small press-fit joints of them under pressure, are available from all plumbing suppliers.

The high cost of welding PVC or other wet-stable plastics gives Perspex one advantage over them for the hobbyist. I guess that individuals will have to make up their own minds. I am simply warning that Perspex is not totally stable in contact with water, and the material is brittle.

Graham Webb
South Australia

Silver soldering help wanted

Sir,

Over the years I have had the need to do the occasional silver soldering job with what I considered to be reasonable success. However in those days I had access to oxy-acetylene plant in the welding shop.

Currently, my workshop is only equipped with propane gas and what I thought to be a suitable range of burners for my torch. I have four burners ranging from ultra pinpoint to full flame in conjunction with which I use Comweld G.P. Silver Brazing Flux and Silver Brazing Flux No. 2.

The results achieved are not consistent with that I consider to be required for model engineering. I am not getting a full and even flow of the filler material, almost as though the surface has been poorly cleaned. There also seems to be a tendency for the job and filler material to over heat causing unsightly blobs of filler around the joint area, as if the flux is breaking down before it has time to do its job.

In short, I am not as proficient as I thought I was. Can any of our model engineering fraternity offer any constructive suggestions? If so I would very much like to hear from them. Or, perhaps there is someone out there with the experience in the propane gas field who would like to write an article on the subject for AME.

There must be others out there who have had the same problems as I have had!

Geoff Howarth
New South Wales

Continued on page 54...

News Desk

compiled by Brian Carter

As you can see, the magazines are getting further behind the deadline. The July-August issue was compounded by delivery problems everywhere. I hope that doesn't happen with this issue!

This issue marks my fourth anniversary as Managing Editor and I have had a great deal of pleasure presenting the magazine for you. To be honest, I need a break, so I have decided take a step back and let someone fresh have a go. From the January issue, David Proctor has agreed to take over the Managing Editor's role. This will free me from the deadline pressures and allow me to assist (breathing easier) from the sideline. I won't be out of the picture all together as the AME Directors still have a strong commitment to ensuring that AME continues to provide our readers with the best model engineering magazine we can!

The November issue marks AME's 10th anniversary! We hope to present some special treats for you to absorb over the Christmas break. I have a couple more helpers with the November issue, so we'll try and get the timetable back on track. In any case, David will be getting the feel of the January issue at the same time so we should be right for next year at least.

If you're not sure about advertising, classifieds or letter box times for the November issue, call me and I'll let you know.

Once the November issue is finished I'll put the finishing touches to the AME 10th Anniversary Index which will be a separate publication covering issues 1 to 75 in A4 format. I hope to have it wrapped up for an early 1998 release. We will follow this up with annual index entries.

Oops!

Some of you may have been staring at Les Mouat's aerial photo of the Cobden site in the July-August issue and wondering why the cars were driving on the wrong side of the street! Well, they weren't at the time — unfortunately the slide was printed back to front. Transparency's can be tricky sometimes! You can have a full-colour reprint in seconds... just have another look at the photo, only this time in a mirror.

New Zealand Subscribers

Due to a delivery fault, about 30% of our New Zealand subscribers did not receive their May-June issue. Enquiries to Australia Post did not elicit a satisfactory response or reply. We do not know where the magazines are or went, they just seemed to have vanished into the ether! We have re-posted the May-June issue to those we know have missed out. If there are any more outstanding, please let us know and we will organize a replacement to be sent. To our loyal overseas readers, thank you for bearing with us and the vagaries of our respective postal services.

Blowfly manual

Many of our early issues are now out of stock. Therefore, many parts of Barry Potter's popular 0-4-0 5" gauge steam locomotive *Blowfly* construction series are unobtainable. To this end, we have compiled a manual which is a reproduction of the complete *Blowfly* Series. As a bonus, we have included the three part series on Ross Bishop-Wear's driving truck which makes an ideal accompaniment to the *Blowfly* locomotive.

The manual is spiral bound so it can be opened out flat on the workbench. Each page is protected by a plastic sleeve to keep the inevitable oily fingers, swarf and cutting fluids etc., from soiling the pages.

The manual is available from AME Retail for $49.95 including packaging and post Australia wide (see our ad on page 59). The manual and suitable castings are also available over the counter from Live Steam Supplies (Victoria), E & J Winter — Bolton Scale Models (NSW) and Model Engineering Supplies (Victoria) all AME advertisers.

Club listing

A couple of clubs have notified us of some alterations to their listing in the previous issue.

The **Van Diemen Light Railway** situated at the Don River Railway in Tasmania is no longer operational.

Wandong Live Steamers of Victoria. The track is located at Mathieson's Siding. O'Gradys Road has been split by the 12" to the foot scale railway, the portion that runs to the track site has been renamed: The Dene.

Palmerston North Model Engineering Club (NZ North Island)

Track: Palmerston North, Marriner Reserve, Marriner St.

Public Running: 1st and 3rd Sunday afternoons.

Mail to: 22b Haydon St, Palmerston North.

AME payments

I have a request from our treasurer. Because of the wide geographical spread of personnel involved in producing AME, there is often a longer delay than usual before your cheque or credit card payment is processed. Please contact someone at AME *before* you stop payment on your cheque or dispute a credit card transaction. It will save us from having to pay the $10 stopped cheque fees, plus other money for chasing up credit card details. More importantly, it will save us time!

Information Super Railway

AME now has its own internet domain name. If you have access to the internet have a look at: http://www.ameng.com.au
It was only in place for a week when it received a Pick of the Net award as one of the best Australian sites.

The site has information about model engineering, the current issue details plus the cover. There is the Author's guide, a subscription form, AME Retail listing, the full club listing, plus links to other great sites. There is also a special project page which will change from time to time.

AME's Guide for Authors

The four centre pages of this issue is intended to be a pull-out guide for you to keep as a reference. Feel free to contact AME if you have any questions that the guide doesn't answer. We decided to publish the guide this way because the requests for the guide on the January questionnaire were too numerous to post economically.

Articles

I know you've seen this before but we are *reeeely* short of marine and workshop articles. There are a few workshop articles being prepared for publication but there is very little to follow later. We have plenty of club and loco articles but feel free to keep them coming. David Evans' article on copper boiler welding in this issue is very innovative, has anyone done anything innovative in other areas — don't be shy!

Major Centenary Exhibition

We have received details about an exhibition to be held in the UK in September 1998 (date and location in Coming Events).

It is listed as a very special new anniversary exhibition of this century's finest engineering models presented by the Society of Model and Experimental Engineers 1898 - 1998. Also included will be trade stands, lectures and demonstrations.

The organizers hope that many model engineers in the Southern Hemisphere will be able to attend what will be a unique occasion.

Full information is available from the organizers: SMEE 100, Resources Exhibitions Ltd, 2 Forge House, Summerleys Road, Princes Risborough, Bucks, HP27 9DT, UK. Phone: 01844 34 2894. Fax: 01844 34 4988. e-mail: CRE@resourcex.co.uk

Letter Box continued from page 52.

Lathes — looking back

Sir,

Many thanks for the fine article by Don Payne on the Model Engineers Lathe (July-Aug '97).

As an avid reader of those between war editions of English Model Engineer (plus all others) so many of those mentioned were instantly recognisable.

Also in those issues were examples of many fine models/miniatures made on these, by todays standards, crude machines.

My start goes back to the early fifties when the Myford ML7 was £48-10s in the UK and the Zyto 3⅜" was £33-10s. Knock and Kirby's had opened a new store in Wollongong and in one of the windows they displayed the ML7 and the Zyto at (from memory) £96 and £75 respectively. Of course in good old English lathe fashion these did not include motors or chucks.

As a high school student going past that window five days a week to the school train (hauled by the ubiquitous S class) I always paused to survey those contents. The Myford was eventually ruled out but the Zyto was a goer and so on the "never-never plan" I reached the day when the Zyto rested on the bench in the workshop in the next door neighbours place (my mentor).

The Zyto and a ¼" Black and Decker pistol drill in a home-made stand produced a 3½" gauge engine and part of a 5"gauge one.

The pistol drill finally erupted in flames drilling ½" diameter holes. This led to the purchase of that other great model engineering machine, the Fidax drill.

Progress came by way of a New Gregco and a 4¼" Hercus lathe with gear box — sheer luxury — and when I look back to treadle driven lathes and what could be accomplished by correct tool grinding etc., I would say we never had it so good!

There is a great difference between machines that you need to earn your living with and to what you can get by with in your hobby. If you can afford these better quality production machines then you can produce things quicker. If you have some of the older "model makers" type machines it will probably take you longer to produce an article but there is no excuse if the quality does not match up. With time, patience and satisfaction of a job well done you can produce anything. Maybe that is why some of the most outstanding masterpieces of Model and Miniature engineering have been produced by persons with no mechanical training — nobody ever told them they couldn't do it.

Barry Glover
New South Wales

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- 36 recent AME Magazine back issues for sale at $3 each plus p&p. For list of numbers send SSAE to: Curt Christensen, PO Box 246, Blackheath, NSW, 2785

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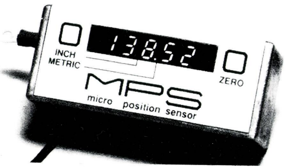

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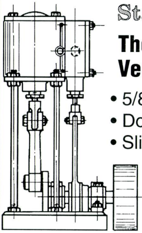

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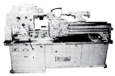

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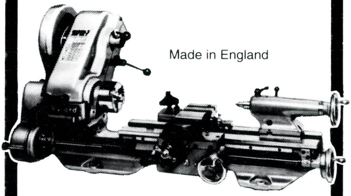

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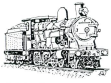

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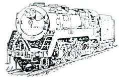

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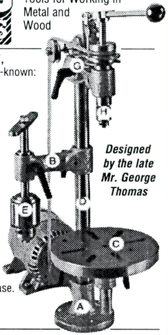

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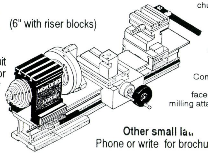

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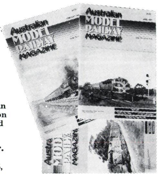

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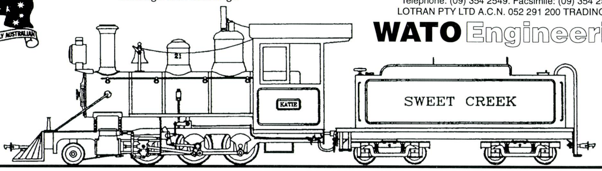

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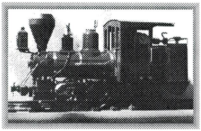

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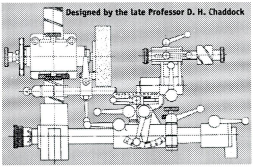

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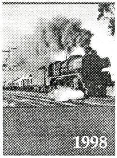

Nostalgic steam scenes (all regular service trains) include, from NSW, Double Garratts blasting up Fassifern bank, 3662+38 on the *Central West Express* on Tumulla bak, 1919 at Darling Island, double Standard Goods leaving Cowra; from Victoria, a J on a Maryborough-Ararat goods, R719 blasting out of Dimboola; from SA, 401 pounding up Belalie bank, 601 in Ellen St, Port Pirie in 1951; from Tasmania, Mt Lyell No.3 at Dubbil Barril; from WA, V1204 dropping down from Collie; and from Queensland, maroon Garratt 1004 at Rockhampton and a C17 on the Brisbane Valley goods.

Diesel gems (again, all regular trains) come from NSW, Bicentennial 8040 and 42218 on a Tahmoor coalie, 4837 on the Bombala goods, 42220 on SL16 Griffith pass at Junee; from Victoria, West Coast B61 on an all-WCR liveried express at Geelong, BL31 and C509 climbing out of Ballarat, immaculate blue and gold S311 on a goods at Springhurst; from SA, 900 *Lady Norrie* a week old at Pt Pirie, double 600s nearing Peterborough, double NRs heading out of Pt Augusta at Yorkey's Crossing, EL51, AL21 and 603 amid the Salvation Jane at Mambray Ck, beautiful CLP14 in the sun's last rays on the *Overland*, and narrow-gauge Brill 106; from Queensland, giant GE 3833 on the *Sunlander*.

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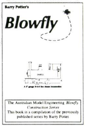

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